



## Goodyear Strike Still Deadlocked

**All Efforts at Compromise Fail; Threats of Violence Prevent Plant Reopening**

The strike situation at the Goodyear Tire & Rubber Co., in Akron appears to be mired in a hopeless deadlock between the management and leaders of the United Rubberworkers Union, and the plant, which has been completely closed down since Feb. 17, continues to be barricaded and picketed by union men, with several hundred Goodyear employees "imprisoned" inside and with more than 10,000 non-striking employees clamoring to go back to work.

Following the union rejection of Goodyear's compromise proposal, the company withdrew all offers of settlement and announced its intention of reopening its factories. The move resulted in a quick union maneuver, nearly 8000 men from Goodyear and other tire company unions in Akron surrounding the factories. Many were armed with clubs, baseball bats and lengths of pipe. This move was countered by the over-night creation of an Akron Law and Order League, whose leaders claim more than 30,000 Akron citizens have joined it in a mandate to

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## Colors for Cars

**Metallic Finishes Now in Style Need Little Trim for Beauty**

The vogue for metallic finishes on automobiles is stronger than ever, according to the Duco color advisory service. Throughout the industry schedules have been changed to accommodate the tremendous demand for this new type of finish, and in many cases where only one metallic was offered at the beginning of production, two or three are now available.

Metallic lacquers in themselves are so iridescent and so brilliant that they need little to augment their beauty. While gray shades are livelier if striped in a bright color, striping often detracts from the attractiveness of other metallic colors. If a car finished in a metallic color has a chrome molding and wide chrome discs on the wheels, it

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## National City Fights Issuance of W-O Trustee Certificates

Objection to the issuance of \$750,000 trustee's certificates to finance production of 15,000 cars by Willys-Overland was filed Thursday in Federal Court in Toledo by the National City Bank, New York, trustee under the first mortgage bond issue. The trustee has fought several of the operating moves of the receiver.

Judge George P. Hahn was to hear objections at 10 a. m. Friday, before making the order for the manufacture and financing permanent.

About 800 employees are now busy at the plant on preliminary work toward manufacture of the first half of the car authorization. Complete cars are expected in two weeks.

## Seagoing Railway May Become Motor Highway

County Commissioners of Key West, Fla., have voted to seek purchase of the right of way for an overseas motor highway, as they have abandoned hope of seeing trains running again over "the railroad that goes to sea." The commissioners have designated Chester B. Treadway, chairman of the State road department, to negotiate.

## Demand Overruns March Schedules

**Sharp Pick-up of Dealer Orders Pushes Output Up to What May Be New Record**

By HAROLD E. GRONSETH

An increase of nearly 60 per cent in retail sales of motor vehicles this month over the February volume is indicated by deliveries to date and the current rate of expansion in consumer demand. Passenger car sales are expected to total 300,000 units, while truck sales may run to 53,000 units, or an aggregate of 353,000 vehicles. This estimate, considered conservative, represents an increase of 58 per cent over the preceding month and is slightly higher than the volume enjoyed in March last year which had the benefit of more recent automobile shows. Sales are on a sharp upgrade throughout the industry. Some of the leading producers are expecting to set all-time delivery records this month.

Most of the motor companies were too conservative when they set up their tentative March schedules. With what appeared to be adequate field stocks at the start of the month they hesitated to rush headlong into heavier production programs just because spring had arrived. They preferred to await con-

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## Plastics for Bodies

**Panels Should Replace Fabrics for Interior Trim, Says Lougee**

A new conception of passenger car interior trim and decoration was visualized by E. F. Lougee, editor of *Modern Plastics*, in his talk before the Detroit Section S.A.E. this week. He implied that cloth upholstery and padding are relics of the past and that modern styling would emerge one of these days in the form of laminated plastic linings for the entire interior. It looks feasible, according to Mr. Lougee, to make complete panel moldings in one piece so that a door panel would include not only the panel lining but also the window molding. Interior trim, if handled in this fashion, would simplify the trim line and materially reduce costs.

Molded interiors could carry out any

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## Wilson of Willys



David R. Wilson, recently elected president, and a director of the Willys-Overland Co., is one of the most popular men ever connected with the plant. As an associate of his brother, Charles B. Wilson, in the Wilson Foundry & Machine Co., Pontiac, Mich., he has been close to the Willys-Overland situation for many years. It was his brother who managed Willys-Overland in the early 1920's when it was laboring under a \$22,000,000 debt.

Soon after the receivership was established three years ago for the property in Toledo, David R. Wilson was named operating head of the plant. He succeeded L. A. Miller. "Dave," as he is quite generally known in the industry and around the plant, is a production man. He knows the machines, materials and methods, and due to his long association in the plant side of the business knows how to get along with the men.

Mr. Wilson is 62. He was born in Akron and his first job was as water-boy for a street repair gang. He later went to nearby Barberton and became the first apprentice in the Diamond Match Co.'s plant in that town. After four years in the match factory he returned to Akron. In 1903 the lure of the automobile took him to Lansing, Mich. It was in 1914 that he and his brother, Charles B. Wilson, purchased a small jobbing foundry in Pontiac, and from then on they increased their business and their acquaintance among automotive leaders.

The Wilson Foundry & Machine Co. built many engines for the Willys-Overland Co. At one time it built nearly all the Knight motors. In recent years it operated virtually as a subsidiary of Willys-Overland.

In 1934 Mr. Wilson was called to Toledo to take charge of the plant and was made receiver.

He called frequent shop meetings, talked things over with the men in the shop, and quickly won the confidence of the men in his program. He never fails to go into details on a mechanical operation. He really likes the shop better than the office.

They tell a story of how he walked out to the loading docks one day with a friend. They looked around. He borrowed a "chew" from one of the men, and then introduced himself. The workmen told him it was the first time that a head of the company had been out there in years.

Mr. Wilson frequently flies between Toledo and Los Angeles on sales missions. He has managed to keep production going through the plant without the help of a line of advertising. For recreation, he likes to fish and hunt.

He is now trustee for the property under Section 77-B of the Federal bankruptcy act pending reorganization. Hearing was to be held on March 20 by Federal Court to appoint Mr. Wilson permanent trustee.

## Freer Foreign Trade Means World Peace

*Will Also Lead to Fuller Employment, Says Smith; Graham Cites Export Gains*

Seven major benefits resulting from a liberal foreign trade policy as opposed to restriction were outlined by Edgar W. Smith, vice-president of the General Motors Export Co., in an address before the Export Managers Club at the Hotel Pennsylvania Tuesday.

Hopes for a sound money condition in many nations of the world, leading to business recovery, are raised by steps toward freer foreign trade, he said. Mr. Smith commented that a liberal foreign trade policy leads inevitably to some acceptance of goods in payment for exports and in that way relieves the world gold and debt strain.

Closely allied to the matter of sound money, he said, is the tendency of foreign trade to promote higher living standards in all countries doing an international business. The opposite extreme is illustrated, he continued, by the strictures imposed on a population by the diversion of production to war purposes. Foreign trade is restricted as to its normal functions by war, he said.

Mr. Smith gave it as his view that freer foreign trade is a definite step toward peace. The opposite condition is economic nationalism, he said.

A more liberal foreign trade policy also will lead to fuller employment, he said, stating that records show a larger net usage of labor, even considering displacements, when international trade is larger. He added that a self-reliant agriculture depends on foreign trade and cannot prosper without foreign markets.

Foreign trade also leads away from regimentation, Mr. Smith said.

The dependence of domestic prosperity upon the continuing expansion of world trade was also the thesis developed by Robert C. Graham, chairman of the export committee of the Automobile Manufacturers Association and vice-president of Graham-Paige Motors Corp.

"Numerous domestic industries in addition to export interests, including manufacturing, farming, mining, distributing, banking and other fields, have benefited materially from the recent improvement in foreign trade," Mr. Graham declared in his address at the annual dinner meeting Tuesday night.

"It is consequently incorrect to measure the results of the reciprocal trade program solely from the viewpoint of increased export volume," he said. "Imports, too, must be considered because they provide not only a means of paying for exports, but insure the continuance of jobs among the vast number of Americans who handle, distribute and merchandise the products of other countries."

Comparing farm conditions in 1932 with those existing today, Mr. Graham said that "the American farmer wasn't exporting corn in that year; he was giving it away" adding that today the farmer is receiving a reasonable return for his products and is purchasing new equipment, radios, furniture, automobiles and other manufactured goods.

Neither is any damage seen by Mr. Graham in any tendency by people of other lands to purchase securities on our stock exchange. "Many stocks on the basis of actual merits, are underpriced and their purchase by people overseas as a result of increased two-way trade will aid in restoring their true value," he declared.

Mr. Graham disclosed that the automobile industry has benefited from a revival in foreign sales which "from a low of 180,000 units in 1932 rebounded to 565,000 last year, with excellent prospects for 625,000 units for the present year."

Citing specific gains realized in exports to those countries which have concluded reciprocal trade agreements with the United States, Mr. Graham declared that shipments of automotive products to Cuba and Belgium last year increased 155 per cent and 121 per cent, respectively, over corresponding periods in the previous year when trade pacts were not in effect.

### Ricardo Diesel Expert Visits Waukesha Plant

J. H. Pitchford of Shoreham, England, Diesel expert and assistant to Harry Ricardo, of Ricardo & Co., has been visiting the research department of the Waukesha Motor Co., licensee for Diesels under the Ricardo patents. Regular visits are planned between the staffs of Ricardo and Waukesha at six-month intervals.

## Metal Coatings for Aircraft Structures

### Doctor Wick of Bureau of Standards Reviews Foreign Practice; Finds Wide Use of Cuprous-Oxide Rectifiers

Cuprous-oxide rectifiers are widely used in England to convert alternating into direct current for electro-deposition, according to Dr. Richard M. Wick, National Bureau of Standards, who spoke at a recent meeting of "The Aircrafters" in Philadelphia. Doctor Wick recently returned from a European trip made to study foreign practice in metal protection for aircraft. Referring to the use of the cuprous-oxide rectifier in place of rotary converters, he said this rectifier had been invented in this country, by Dr. L. O. Grondahl of the Union Switch & Signal Co., Pittsburgh, but it had never been used in plating establishments here. When thinking of this type of rectifier we usually thought of a device for radio use, in which relatively high voltages and small amperages are required. In electro-deposition the voltages are low and the amperages very high, and the problems involved are therefore quite different. This development in England has occurred during the past year.

The speaker said it was well known that if the process of electro-deposition was interrupted, the resulting coating was not very satisfactory, and to prevent such interruption due to failure of the current source, plating establishments in England usually have a standby battery installed, which in some cases is thrown into circuit automatically in the event of failure of the regular current supply.

At least three firms in England are engaged in electro-deposition for mechanical purposes, repairing worn parts of expensive machinery and reclaiming parts that have been spoiled

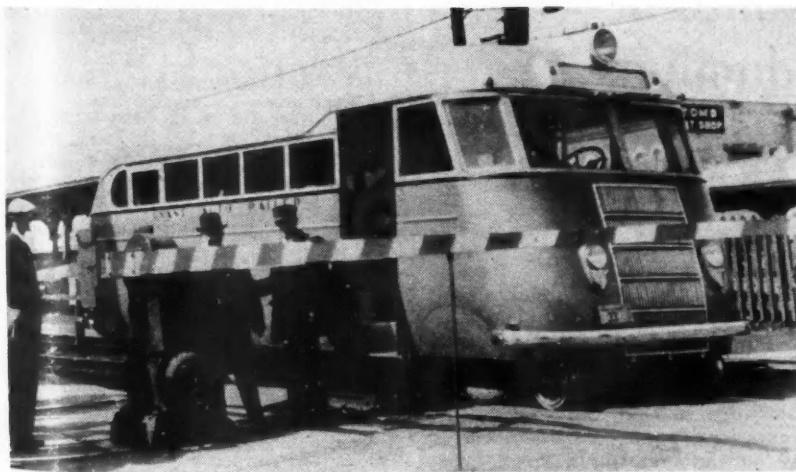
in the course of manufacture. In such salvage and repair work, nickel coatings up to  $\frac{1}{4}$  in. in thickness are deposited. In France there are two firms engaged in this line of work, and one of them makes a specialty of depositing coatings of a nickel-cobalt alloy. This process of depositing two metals simultaneously is still being very little exploited, the speaker said. This nickel-cobalt coating has a Brinell hardness of about 450, as compared with 250 for nickel and 600-1000 for chromium.

In Germany all metals are under government control, and government control of the plating industry is so strict as to be tantamount to a licensing system. The reason for this is that many of the non-ferrous metals are not mined in the country and Germany cannot obtain the foreign exchange which would be necessary to import them. This situation has influenced the trend of research work to some extent, and Doctor Schlötter has invented a tin-plating process by which one-third of the tin usually required is saved, the coating obtained being more dense. Doctor Schlötter is also the inventor of a bright nickel process and claims to have a workable process for depositing chromium from its trivalent salts.

Considerable work is being done on the problem of protecting magnesium parts against corrosion. Doctor Wick visited the Farnborough Laboratory in England, where Doctor Sutton developed his chemical process for forming a protective coating on magnesium in half an hour. Another immersion process for forming a protective coating on magnesium is due to Doctor Bengough. The chrome-pickle process has been developed by the I. G. Farbenindustrie A.-G. at its Bitterfeld works. None of these processes is entirely satisfactory, however, and the I. G. concern is now working on a new chemical process, as is also the firm of Siemens & Halske, which is studying a new electro-chemical method. As these processes were still under development it was impossible to learn much about them. In this country the very able staff of the Dow Chemical Co. is constantly working on the problem as are also the Laboratories of the National Bureau of Standards, which would seem to justify the hope that a satisfactory solution will soon be found.

While in England, the speaker also visited the plant of the Kayser Ellison Steel Co. which is known for its excellent valve blanks. The material used for these valves, K.E. 965, contains 12 per cent nickel and 12 per cent chromium, but Doctor Wick thought the excellent qualities of these valves might be due as much to the processing of the steel as to its composition.

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Acme photo

The Evans Auto-Railer, a motorbus that can be operated on highways or on railroad tracks, was given a trial run recently on the Chicago, Aurora & Elgin RR. at Wheaton, Ill. The bus is equipped with two sets of wheels, one set rubber-tired, and the other having steel flanges.



## Oil Industry Planning for "Lubricate for Safety Week"

Preliminary plans have been made by a group of oil company executives at a meeting held in the headquarters of the American Petroleum Institute for cooperative effort by the entire petroleum industry in promoting practical efforts for highway safety.

The plans tentatively provide for encouraging motor vehicle operators to drive safely by observing accepted safe-driving principles and methods, and to maintain their vehicles in safe operating condition through regular inspection and lubrication of working parts. It is planned to instruct filling station attendants to report to motor vehicle operators any observed mechanical difficulty tending to render unsafe the operation of any vehicle serviced.

It was decided to inaugurate the safety effort with a "National Lubricate for Safety Week" to start May 23 and run through May 30. It was also proposed, however, to establish as a regular activity of the industry, and as an added service to the motoring public, the widespread dissemination of approved principles and methods for safe operation of motor vehicles.

## National Automotive Fibres Selling Agents for Artloom

Announcement is made by C. S. Newton, president of the Artloom Corp., Philadelphia, of the creation of a separate division of the company devoted exclusively to the manufacturing of automobile fabrics and the appointment of the National Automotive Fibres, Inc., of Detroit, as exclusive selling agents for the division. Heretofore, automobile fabrics have been manufactured and sold by the regular upholstery fabric division of Artloom.

## Canadian Branches Continue Fight on Tariff Reductions

The automobile industry in Canada is making strong representations to the government at Ottawa, Ont., for relief by way of tariff changes. A brief presented some time ago set forth that the average profit to manufacturers on cars was only 75 cents. Under the trade agreement with the United States, cars costing \$1,200 or less are dutiable at 17½ per cent, instead of 20 per cent as formerly. Between \$1,200 and \$2,100, the reduction was from 30 to 22½ per cent, and above that, from 40 to 30 per cent. The excise tax on the first category was 3½ per cent and on the other grades somewhat higher.

Representatives of the industry are in Ottawa, placing their case before the government and the general question awaits a report from the Tariff

Earnings Statements of Automotive Companies		
	1935	1934
Allis-Chalmers Mfg. Co. ....	\$1,985,137	*\$1,039,406
Aluminum Industries, Inc. (Permite Products) .....	72,675	69,321
Borg-Warner Corp. ....	6,982,732	3,750,576
Caterpillar Tractor Co. ....	†1,129,188	†625,969
Eaton Manufacturing Co. ....	1,838,489	977,975
Gabriel Co. ....	*112,726	*140,759
Hercules Motor Corp. ....	400,438	214,506
International Harvester Co. ....	19,618,238	3,948,636
Thompson Products, Inc. ....	709,395	381,298
<b>Oil Companies</b>		
Phillips Petroleum Co. ....	13,421,703	5,757,308
Socony-Vacuum Oil Co. ....	‡22,500,000	24,121,237
Standard Oil Co. of Kentucky.....	2,197,808	2,599,466

\* Net loss.

† Two months ended Feb. 29.

‡ Estimated.

## By-Lines

By ADDISON PERRY-KEENE, cost controller, the Austin Motor Co., Ltd., Birmingham, England, "Vigorous Budgetary Control Paves Way to Increasing Profits," in the Executive Service Bulletin, March, 1936, published by the Metropolitan Life Insurance Co.

By WALTER A. OLEN, president, the Four Wheel Drive Auto Co., Clintonville, Wis., "Continuous Cultivation of Interest Enhances Company Relations," in the Executive Service Bulletin, March, 1936, published by the Metropolitan Life Insurance Co.

By FRANKLIN SNOW, "Rail versus Automotive Advertising," in *Advertising and Selling*, Feb. 13, 1936.

## Cleveland Fisher Plant Now Has 8500 Employees

The Fisher Chevrolet body plant in Cleveland is now almost at capacity, working on a three-shift, 21-hour day, five days a week. A total payroll of 8500 men makes this company the largest employer in the city.

its annual features, in the nature of review, consideration has not been given to its contents.

Adequate protection for the Canadian motor car will bring about a higher Canadian content, more Canadian material and more work and better wages for Canadian workmen, Harry J. Carmichael, vice-president of General Motors Products of Canada, Ltd., Oshawa, Ont., declared in an address last week. Mr. Carmichael said the Canadian industry unfortunately had been compared to the American automobile industry in the Tariff Board investigations. English motor cars sold at prices 50 to 60 per cent higher than Canadian cars because the people and the Government realized it was better to have an industry paying good wages and dividends than to sell cars at half price, he declared. "We could sell cheaper cars by reducing wages," Mr. Carmichael said, "but I and the workmen will oppose that."



List of Inspected Gas, Oil and Miscellaneous Appliances, December, 1935. — Underwriters Laboratories, 207 East Ohio Street, Chicago, Ill.

Nebraska Tractor Tests 1920-1935. Published by The University of Nebraska, Lincoln, Nebr. This bulletin summarizes the results of 80 tractor tests and includes data on all tractors reported by their manufacturers as on the market on Jan. 1, 1936.

The Engineer Directory and Buyers Guide 1936-37. Published by the Proprietors of The Engineer, 28 Essex Street, Strand, London W.C.2, England. This is a general directory of the British industry of mechanical products, arranged according to products. Translations of the technical headings used in the directory into French, German, Italian and Spanish are given.

Forschungsheft 376 (Research Bulletin No. 376) of the German Society of Engineers, published by V.D.I. Verlag, Berlin NW 7, Germany, contains two papers of automotive interest. The first is entitled Indizieren schnellaufender Verbrennungskraftmaschinen (Indices of High-Speed Internal-Combustion Engines) by Dr.-Ing. Emil Kallhardt; the second, Schwingungen von Luftseulen mit grosser Amplitude (Oscillations of Air Columns with Large Amplitude), by Dr.-Ing. Clemens Mayer-Schuchard.



## G.M. Feb. Overseas Sales Broke All Previous Records

Sales of General Motors cars and trucks to dealers in the overseas markets during February totaled 27,911 units, and represented the highest February volume in the history of General Motors overseas operations. This volume was 19 per cent over the volume in the corresponding month of last year, and 9.1 per cent over the volume in January of this year.

In the first two months of 1936, sales totaled 53,493 units, representing an increase of 25.5 per cent over sales of 42,613 units for the corresponding period of 1935.

## G.M.'s Detroit Show Set Attendance Records

The fourth annual Detroit showing of General Motors products which closed March 14, broke all attendance records. More than 300,000 persons crammed General Motors auditorium in the eight days, more than twice the number at any preceding show staged by the corporation in Detroit, and the largest crowd ever to pass through the General Motors Building in a similar period.

## Continental Motors Buys Westinghouse Farm Light

Continental Motors Corp. has acquired the farm lighting division of Westinghouse Electric and Manufacturing Co. and will move operations to its Muskegon plant, according to W. R. Angell, Continental's president. Transfer of tools, dies and other equipment from East Pittsburgh is expected to be

completed within a fortnight. Continental will continue to use the Westinghouse generating and control units but will build the powerplant which formerly was also built by Westinghouse. Herbert A. Mitchell, who will manage the new Muskegon division, estimated that approximately 100 additional men would be employed when operations get under way.



**GEORGE S. COLE** of the Leece-Neville Co., Cleveland parts manufacturers, was elected president last week of the Cleveland Club. Mr. Cole was one of the founders of the club and its first treasurer.

**THOMAS M. NEVIN**, formerly with Budd Wheel Co. of Detroit, has been appointed general sales manager of the Rockwell Products Co., Hartford, Conn., makers of the Electroflo Power Brake system.

**WILLIAM E. HOLLER**, vice-president and general sales manager of Chevrolet Motor Co., recently was commissioned a Texas Centennial Ranger by Governor James V. Allred. The presentation took place at Texas Centennial Exposition grounds in Dallas, and the honor was in recognition of Mr. Holler's eminence in the automobile industry and his friendship for Texas.

**A. R. SANDT** has been appointed executive secretary of the Automotive Electric Association, succeeding Earl Turner.

**S. L. BRADLEY** has been appointed sales manager for the Ross Gear and Tool Co. of Lafayette, Ind. Mr. Bradley has been associated with the Ross sales organization for more than 18 years.

## Safety Glass Made From New Plastic

*Greater Strength at Low Temperatures and Higher Shock Resistance Claimed*

A new high-strength safety glass has been announced by the Pittsburgh Plate Glass Co. In its development the Carbide and Carbon Chemicals Corp.'s research department at Mellon Institute collaborated with the Pittsburgh Plate Glass Co.'s Duplate Research Laboratory in Creighton, Pa.

The secret of the new safety glass is said to lie in the development of Vinal, a new plastic of unusual elastic and tensile properties. Laminated safety glass is made of two layers of glass with an intermediate layer of the transparent plastic, the assembly being subjected to heat and pressure. The shatter-proof property of the glass results from the adherence of the glass particles to the plastic.

The new Vinal plastic is said to have made it possible to overcome certain limitations of earlier types of safety glass. The latter can be broken through by very heavy impacts, and their shock resistance is impaired by low temperatures. Tests of the new safety glass extending over three years are said to have shown it to be approximately 10 times as resistant to breakage as other types at 10 deg. F. below zero, and five times at 70 deg. The new safety glass, because of the high elasticity and great tensile strength of the plastic, is said to yield under impact and absorb its energy. If broken by a series of impacts, a sheet of high-test safety glass, it is stated, can be rolled up like a rug, with virtually no glass leaving the plastic.

Vinal is composed of a synthetic resin of the vinyl group, called vinylite X, and a plasticizer designed to develop and control its physical characteristics. It is said to have all the good properties of the plastics commonly used in making safety glass, such as cellulose acetate, cellulose nitrate, and methyl acrylate, plus elasticity and high tensile strength at low temperatures. Its use also simplifies the manufacture of safety glass, for it eliminates the necessity for edge sealing, it does not need heat for cutting of the laminated glass, it requires no adhesives for cementing it to the glass, and it is proof against discoloration by sunlight and decomposition by extreme atmospheric heat.

## Retail and Wholesale Financing Down in January; Above Jan. '35

Retail automobile financing in January amounted to \$93,257,970, a decrease of 10 per cent from the previous month and an increase of 58 per cent over January, 1935, according to figures of the Bureau of Census, Department of Commerce. While the number of used cars financed remained practically the same for January and

December, there were approximately 17,000 less new cars handled in this way.

Wholesale financing for January was 20 per cent below the December figure and 28 per cent above January, 1935. A table composed of the comparative statements of 465 identical organizations is given below.

	Wholesale Financing Volume in Dollars	RETAIL FINANCING											
		TOTAL			NEW CARS			USED CARS			UNCLASSIFIED		
		Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car
January 1936.....	\$123,195,888	242,324	\$93,257,970	\$385	103,083	\$58,152,479	\$564	137,747	\$34,607,928	\$251	1,494	\$497,563	\$333
December 1935.....	154,382,330	260,764	103,200,806	396	120,301	67,423,356	560	137,962	34,779,967	252	2,501	997,483	399
January 1935.....	96,059,710	159,094	59,105,614	372	68,464	37,194,801	543	87,177	20,650,382	237	3,453	1,260,431	365

# Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

There was a moderate recession in general business last week, which was mostly the result of a sharp decline in coal production and a slight falling off in electric output. Sales of heavy machine tools were well sustained, and some manufacturers are behind in their orders. Wholesale and retail business was the best since the beginning of this year.

## Carloadings Off

Railway freight loadings during the week ended March 7 totaled 634,828 cars, which marks a decline of 38,295 cars below those in the preceding week, an increase of 47,638 cars above those a year ago, and a rise of 20,708 cars above those two years ago.

## Store Sales Holding Up

According to the Board of Governors of the Federal Reserve System, the adjusted index of department store sales during February stood at 80, based on the 1923-25 average as 100, as against 79 for the preceding month. The dollar volume of sales was 13 per cent above that in the corresponding month last year, but this increase reflects in part the fact that February of this year contained one more business day.

## Power Output Steady

Production of electricity by the electric light and power industry in the United States during the week ended March 7 was slightly below that in the preceding week, but was 9.8 per cent above that in the corresponding week last year.

## Employment Higher Than Year Ago

According to report recently issued by the Secretary of Labor, employment in January declined seasonally. Approximately 650,000 fewer workers were employed in the industries included in the report than in December, but there were about 470,000 more individuals employed than in the corresponding month last year.

## Lumber Production Unchanged

Lumber production during the week ended Feb. 29 was 51 per cent of the 1929 weekly average. New business was 8 per cent below that in the preceding week and was the smallest since last September. There was a decline in shipments of about 2 per cent, and production remained unchanged.

## Fisher's Index

Professor Fisher's index of wholesale commodity prices during the week ended March 14 stood at 82.4, as against 82.8 the week before and 83.3 two weeks before.

## Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended March 11 showed a decline of \$1,000,000 in both holdings of discounted bills and of Government securities. Bills bought in the open market remained unchanged. Money in circulation declined \$8,000,000, and the monetary gold stock increased \$3,000,000.

equipment for the entire line.

The line has been redesigned to take advantage of the lighter weight and greater strength of high tensile alloy steels and arc-welded construction. Higher speed operation and greatly reduced operating costs are direct results of the reduction in weight. At the same time heavier mechanisms have been installed to take care of added power and speed.

## So. Friction Fabric Becomes So. Friction Materials Co.

A change in the name of the Southern Friction Fabric Co., Charlotte, N. C., to Southern Friction Materials Co. was authorized at the annual meeting of the board of directors held last week. There was no change in ownership or management. Practical completion of the company's modernization program was announced.

## GM 1936 Stockholders Number More Than in '35

The total number of General Motors common and preferred stockholders for the first quarter of 1936 was 353,186, compared with 337,218 for the fourth quarter of 1935, and 350,663 for the first quarter of 1935. Of the current total, there were 333,333 holders of common stock and 19,853 of preferred stock.

## Allis-Chalmers Output Up 60% Over Year Ago

Allis-Chalmers Manufacturing Co., Milwaukee, reports that it has stepped up tractor production 60 per cent over a year ago, as the result of marked improvement in agricultural as well as industrial demand.

## 5-Pass. Convertible Sedan Added to Packard 120 Line

A five-passenger convertible sedan has been added to the Packard 120 line. It lists at \$1,395 f.o.b., Detroit.

## New Motor Equipment to Cost New York City \$7,500,000

New York City is preparing to spend \$7,500,000 on modernization of the Sanitation Department's automotive equipment, according to an announcement by Mayor La Guardia this week.

A survey of the equipment now in use shows that some of the city's trucks cost as much as \$900 a year for repairs and maintenance. Last year 465 trucks were taken out of service, and this year the number will be close to 600. Plans call for the purchase of about 1000 new trucks, scrapers and snow plows.

Newer designs in equipment are being studied by city officials, the aluminum-bodied trucks recently purchased having proved successful. Present snow removal methods are considered antiquated and are no longer effective in a city the size of New York. The Mayor

pointed out that some method should be devised for removing snow soon after it has fallen and before it has had a chance to become packed into ice sheets.

## Harnischfeger Shovels Now All-Diesel Powered

Harnischfeger Corp., Milwaukee, has announced that Diesel power has been adopted as Standard equipment of its entire line of excavators from  $\frac{5}{8}$  to 4 cu. yd. capacity. The only exceptions are found in the P. & H. Ward-Leonard electric machines of from 2 to 4 cu. yd. capacity and the smaller Bantam-Weights of  $\frac{3}{4}$  and 1.2 cu. yd., powered by Ford V-8 engines. Diesel may also be had in the Bantam-Weights if desired. Although gasoline power is still available, Harnischfeger is said to be the first shovel manufacturer to swing to Diesel as standard

## 40 Years Ago

—with the ancestors of  
AUTOMOTIVE INDUSTRIES

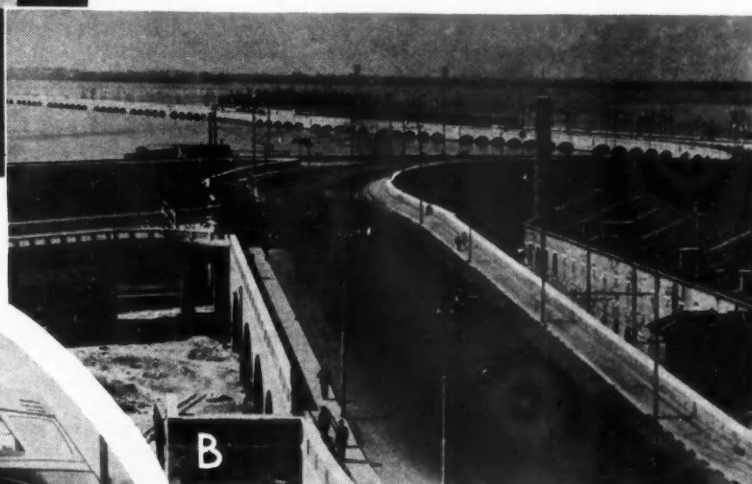
Those who have followed closely the recent changes in the construction of motor vehicles abroad cannot fail to have noticed the tendency to a lower and longer build. The low center of gravity and extended base give stability, make the vehicle easy of access and lessen the danger of accident. The appearance is naturally strange at first, but we shall soon grow accustomed to it. The mechanic must set the fashion. —From *The Horseless Age*, March, 1896.



# The WORLD on WHEELS

**A. Venice—city without streets—now claims to have the most modern garage in the world. Wide ramps give access to the different floors of the building recently completed which will house cars of visitors arriving from the mainland.**

**B. A wide causeway from Mestre permits tourists to drive into the heart of Venice.**



**D. The Great Western Railway, of England, has put into operation 16 additional streamlined rail-car services on its lines west of London.**

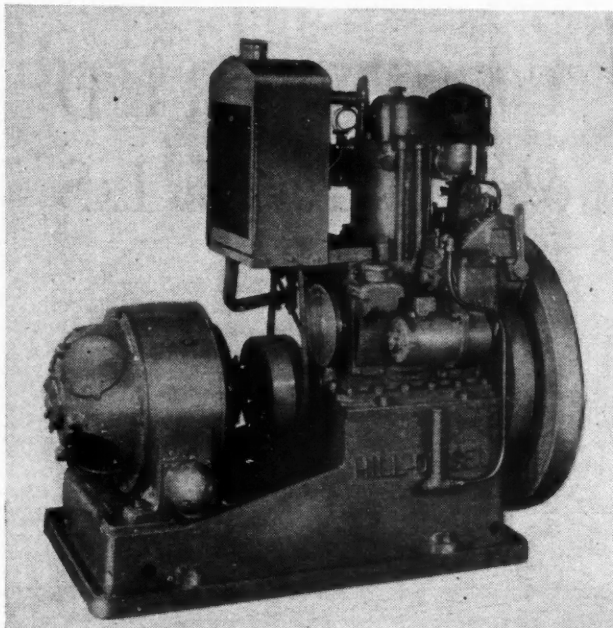
**E. Tokyo tries out its first police cars equipped with wireless telephones.**

**C. Mickey Mouse delights little patients in a Manchester, England, hospital. When Walt Disney was asked permission to use his characters on a new ambulance, he not only granted it but furnished the designs with which the inside as well as the outside is covered.**



European and Globe photos.

*Automotive Industries*



Hill Diesel-powered marine emergency lighting unit. (Description appears on Page 430.)

## Goodyear Strike Still Deadlocked

(Continued from page 421)

the city, county and state authorities to enforce the law and permit non-strikers to resume their work.

March 16, Frances Perkins, Secretary of Labor, telegraphed P. W. Litchfield, president of Goodyear, urging a resumption of negotiations to break the deadlock. Mr. Litchfield replied that every effort was being made to bring about a fair and honorable settlement but that "the forces that prevented acceptance of that proposition, and the manner in which it was turned down, leads us to believe that those forces would block any settlement because peace is not their objective." A vast majority of Goodyear employees, Mr. Litchfield continued, are not in sympathy with the strike and have been prevented by force from working.

Indications were that any attempt to reopen forcibly the Goodyear factories would be met with organized resistance and would precipitate an industry-wide strike in Akron. Upon the report that the plant would be reopened Monday, March 15, more than 8000 union men gathered in East Akron and formed a solid phalanx around the factories and offices. Union groups from other Akron tire plants joined the picketers.

Union leaders have wired an appeal to William Green, president of the American Federation of Labor, to come to Akron to command their ranks. Meanwhile, citizen groups appealed to Governor Martin L. Davey for state action and state militia. Akron business leaders say the strike has taken \$100,000 a day out of circulation in Akron and has seriously crippled all lines of business.

Some of Goodyear's original equip-

ment tire customers are beginning to feel the effect of the stoppage of tire shipments, it is stated. Estimates place Goodyear's production loss so far from the strike at more than 1,250,000 tires.

## Plastics for Bodies

(Continued from page 421)

decorative scheme and could be kept clean simply with the use of soap and water. One of the most interesting developments in the plastic field is a clear transparent material which can take the place of glass in certain places. It has flexibility and a certain amount of strength, but as made at present it can be scratched too easily, precluding its use for windshields. However this material is being used on airships and omnibus windows in Europe.

A paper on "The Design and Development of the China Clipper Ships," by Lessiter C. Milburn, vice-president and chief engineer, The Glenn L. Martin Co., was read by Peter Altman in the absence of the author.

## White Motor Co. Optimistic, Jan.-Feb. Sales Above 1935

Current orders for White trucks and buses are breaking records for the past several years, according to reports from the White Motor Co., Cleveland, Ohio. January business showed an increase of 77 per cent over the same month last year, while February sales were more than 100 per cent above February, 1935.

A recent four-day period brought orders from nine customers for 273 trucks, and total sales for February included 997 trucks and buses. Company officials predict March deliveries in the neighborhood of 1200 units.

## Permanent Economic Study Asked by Berry

*Industrial Council Report Also Recommends Business Controls in Emergencies*

Establishment of a permanent Advisory Economic Council through which the Government would institute a continuing study of national income was urged in a committee report adopted by the Council for Industrial Progress and made public by George L. Berry, industry coordinator, after discussion of the council's program with President Roosevelt. Three other recommendations also were made by the committee and adopted by the council as a part of a "national industrial policy designed to increase consumer buying power." The other recommendations urged production control under emergency conditions, fixing of minimum wages and maximum hours, and fair trade practices.

A special committee recommendation that the present Federal Trade Commission be "relieved of the disadvantage of both administrative and judicial capacities" by an independent commission to deal with the anti-trust laws was also adopted by the council and submitted to the President.

The fact that the reports, to be followed by others, were presented to the President, was taken to mean that the Berry Council will be continued, possibly by executive order. Unless such an order is issued, or additional legislation is enacted, the council will cease to function on April 1 since that is the date the existing N.R.A. law expires and the council is operating on N.R.A. funds. Additional legislation at the present session seems improbable. An executive order could continue the council by means of transferring funds to it from some other Government organization.

The council is not represented by the larger industries of the country, such as automotive, steel, textile, and lumber. It is made up of representatives of industry and labor, all of the latter drawn from organized labor.

The proposed Advisory Economic Council, in studying national income, would develop its source, distribution and uses and "the forces which cause it periodically to form and freeze into vast pools of disuse, causing the stagnation and paralysis of industry and bringing unemployment and suffering to the people." The council would be made up equally of representatives of industrial management, labor and the public. Its members would be appointed by the President with Senate consent and one-third of the membership would be renewed each year. Included in the group of industrial policy was D. G. Sherwin, vice-president, Caterpillar Tractor Co., Peoria, Ill.

The committee assigned to study the anti-trust laws and the Federal Trade Commission Act is headed by Robert A.



B. Cook, of Phipps, Durgin & Cook, Boston, representing management; and Matthew Woll, vice-president, American Federation of Labor, for labor.

The proposed commission would be made up of "incumbents with legal training, lay representatives of industry, labor and the consuming public" with jurisdiction, but not to the exclusion of the courts, in cases instituted either by the Federal Trade Commission or by aggrieved private parties. The committee found the present anti-trust laws "not entirely potent in preventing many of the destructive, discriminatory or deceptive competitive practices which, once initiated, tend to become general under the competitive pressure which they generate."

The committee also suggested that the anti-trust laws should be amended so as to make unlawful such practices as the loss-leader, destructive price cutting, selling below cost and the maintenance of unfair labor working conditions.

Another proposal made was that in order "to remove the jeopardy attendant to affirmative cooperative action by competitors to eliminate destructive, discriminatory or deceptive competitive practices and thus preserve the sound functioning of the competitive system," a tribunal should be set up under supervision of the Federal Trade Commission to handle voluntary agreements on the part of members of, or associations in, trade and industry subject to review by the courts. These voluntary agreements, it was stated, would have to be "non-monopolistic and in the public interest" and "must in no way infringe or transgress upon the rights of labor freely to organize into trade unions, to select representatives of their own choosing to bargain collectively and to take other joint action designed for their mutual welfare and benefit."

In accepting the report of the committee the council asked that further studies be made with a view toward making specific recommendations.

The council further adopted unanimously a report of the committee of industry and management recommending withdrawal of the Federal Government from competition with private enterprise except under special conditions "where public welfare is vitally concerned."

The committee established the following conditions under which it stated Federal competition is justified:

When required to assure adequate preparation for, and creation of the facilities for national defense.

For the conservation of natural resources.

When for any reason private enterprise fails to conduct needed scientific research and exploratory activities to advance industrial development, or in the interest of public health and safety.

When for any reason private enterprise fails to render a service necessary for the general welfare.

Relying upon the anti-trust laws to prevent exploitation of the public, the

report pointed out that Government intrusion into private business fields was not justified to serve this purpose.

Coupled with the statement that "the Government's true function is to protect and promote the economic activities of its citizens, not to supplant them," the committee recommended that the Government should pursue "the sound policy of using to the maximum the facilities of private enterprise."

## Colors for Cars

(Continued from page 421)

will usually be more attractive if no other accent is used.

Undoubtedly, gray is and probably will continue to be the most successful metallic color. Being the most metal-like, it is the metallic least affected by varied lighting. Gray shades run the gamut from pale beige gray through green and blue-green to blue.

There are many handsome metallic colors in the range of not-too-bright brown, blue, and green variations. Browns look well with orange, yellow, and turquoise blue striping. Sea and emerald greens, as well as vermilion, can be used to good advantage as accent colors. Green is always at its best striped with gold bronze or a brighter green, while blue seems most adaptable to a stripe of blue lighter and brighter than itself.

Dark blues and greens containing only a barely perceptible amount of metallic content have great depth. While these may be garnished with conventional stripings, the dark blue is enhanced by a dark scarlet stripe, and a wide stripe of bright green banded by lines of gold deepens the rich tones of dark green.

## Demand Overruns March Schedules

(Continued from page 421)

crete evidence of the retail market's ability to absorb a larger output. With reports at hand from dealers on actual deliveries during the first 10 days, and in some cases the first two weeks of the month, the factories now have a

better feel of the market and find that demand is strong enough to warrant upward revisions in the current month's schedules.

Even before the retail figures were available, a good gauge of the trend of sales was had in the sharp pick-up of dealer orders. Dealers had not been pushed to take cars during the bad weather season so that the upturn in consumer demand and brighter outlook found quick reflection in the flow of dealer orders to the factories. For the past two weeks these have been increasing by leaps and bounds. Probabilities are the industry's March output will go beyond the 400,000 units originally estimated for the month and production men are talking peak activity for April.

Mild weather has brought rapidly increasing activity to used car departments and the factories no longer fear that used vehicles will prove a hindrance to new car sales this season. Stocks are moving out at a good rate, in most instances as fast as the cars are coming into dealers' hands and, in a few cases, faster. Stocks increased about 7 per cent during February, but leading companies report that their dealers have only four to five weeks' supply on hand. Dealers' inventories of used cars at the end of February were estimated at 560,000 units.

## Buick's March Schedules Up 47% Over Feb. Production

Substantial increases in both domestic and export deliveries have necessitated a second boost in Buick's March production schedules which have been raised to 14,254 cars from the 12,888 originally planned. This is exclusive of Canadian shipments and compares with February output of 9698 units, an increase of 46.9 per cent. Current production rate is on par with the heaviest production days last fall when the 1936 cars were announced. Manufacturing divisions are operating five days a week with two and three shifts in some departments.

There has been little fluctuation during the winter months in employment which totals approximately 14,000, but this force will be on increased work schedules in March.



Pontiac De Luxe 8 Cabriolet

# Buyers Switching to Costlier Cars; \$1000 Price Class Up Most in Jan.

U. S. New Car Registrations and Estimated Dollar Volume by  
Retail Price Classes—January

	UNITS			ESTIMATED DOLLAR VOLUME*						
	1936	1935	Per Cent Change	Per Cent of Total		1936	1935	Per Cent Change	Per Cent of Total	
				1936	1935				1936	1935
Chevrolet, Ford and Plymouth.....	143,665	97,728	+ 47.0	66.58	71.59	\$86,600,000	\$61,600,000	+ 40.6	58.04	63.98
Others under \$750.....	28,959	18,021	+ 60.7	13.42	13.20	20,900,000	13,000,000	+ 60.7	14.01	13.50
\$751-\$1000.....	32,384	15,870	+104.0	15.01	11.62	27,000,000	13,500,000	+100.0	18.10	14.02
\$1001-\$1500.....	9,070	3,292	+175.5	4.20	2.41	10,400,000	4,100,000	+153.6	6.97	4.26
\$1501-\$2000.....	751	719	+ 4.4	.35	.53	1,300,000	1,200,000	+ 8.3	.87	1.25
\$2001-\$3000.....	540	552	- 2.2	.25	.40	1,400,000	1,500,000	- 6.7	.94	1.56
\$3001 and over.....	402	345	+ 16.5	.19	.25	1,600,000	1,400,000	+ 14.3	1.07	1.45
Total.....	215,771	136,527	+ 58.0	100.00	100.00	\$149,200,000	\$96,300,000	+ 54.9	100.00	100.00
Miscellaneous.....	11	108	- 89.8							
Total.....	215,782	136,635	+ 57.9							

\* All calculations are based on list price F.O.B. factory of the five-passenger, four-door sedan in conjunction with actual new car registrations of each model. The total dollar volumes for the different models are then consolidated by price classes.

## New Passenger Car Registrations

	January, 1936	December, 1935	January, 1935	Per Cent Change, Jan., '36, Over Jan., '35	Numerical Change, Jan., '36, Over Jan., '35	Per Cent of Total, January	
						1936	1935
Chevrolet.....	62,999	63,785	26,549	+137.0	36,450	29.20	19.43
Ford.....	50,744	54,594	46,306	+ 11.9	4,438	23.52	33.89
Plymouth.....	29,922	32,531	24,873	+ 20.0	5,049	13.87	18.20
Dodge.....	15,240	16,979	8,978	+ 70.0	6,262	7.06	6.57
Oldsmobile.....	11,552	14,212	4,453	+160.0	7,099	5.35	3.26
Pontiac.....	9,377	11,011	5,864	+ 60.0	3,513	4.35	4.29
Buick.....	9,169	12,291	4,240	+116.5	4,929	4.25	3.10
Terraplane.....	4,661	6,037	3,010	+ 55.0	1,651	2.16	2.20
Studebaker.....	3,943	3,998	2,677	+ 47.2	1,266	1.83	1.96
Chrysler.....	3,666	3,552	1,924	+ 90.4	1,742	1.70	1.41
Packard.....	3,030	4,160	431	+ 602.0	2,599	1.40	.32
De Soto.....	2,325	2,409	1,261	+ 84.3	1,064	1.08	.92
Hudson.....	1,752	2,309	1,317	+ 33.0	435	.81	.96
Nash.....	1,467	1,903	833	+ 76.0	634	.68	.61
La Fayette.....	1,128	1,203	851	+ 32.9	277	.52	.62
Graham.....	893	1,075	596	+ 49.8	296	.41	.44
Cadillac.....	856	1,130	297	+188.5	559	.40	.22
Lincoln.....	801	792	115	+597.0	686	.37	.08
La Salle.....	714	1,019	369	+ 93.5	345	.33	.27
Willys.....	707	1,074	267	+165.0	440	.33	.20
Hupmobile.....	328	484	552	- 40.5	-224	.15	.40
Reo.....	241	289	228	+ 5.7	13	.11	.17
Auburn.....	201	245	486	- 58.6	-285	.09	.36
Pierce-Arrow.....	56	79	50	+ 12.0	6	.03	.04
Miscellaneous.....	11	33	108	- 89.8	- 97	.....	.08
Total.....	215,782	237,194	136,635	+ 58.0	79,147	100.00	100.00
Chrysler Corp.....	51,153	55,471	37,036	+ 38.1	14,117	23.71	27.11
Ford and Lincoln.....	51,545	55,386	46,421	+ 11.0	5,124	23.89	33.97
General Motors.....	94,667	103,448	41,772	+126.5	52,895	43.87	30.57
All Others.....	18,417	22,889	11,406	+ 61.6	7,011	8.53	8.35

## Metal Coatings for Aircraft Structures

(Continued from page 423)

The speaker also touched on the subject of fatigue tests and said that whereas in this country we did much fatigue testing on small, highly polished specimens, abroad the tendency was to fatigue-test the actual parts as well. One objection to the test on specimens was that the actual parts usually were not nearly so highly polished, and the results obtained with the specimens therefore were apt to be deceptive. At the D.V.L. (Deutsche Versuchsanstalt

für Luftfahrt) he had seen fatigue tests being made on crankshafts of a special design, in which an attempt was made to equalize the stresses throughout. The shafts, for instance, were made hollow and the internal diameter was varied along the length in accordance with the load distribution.

Considerable work was being done on aircraft propellers. The I. G. Farbenindustrie A.-G. had developed a magnesium propeller which held out considerable promise. The difficulty of corrosion between blade and hub had been overcome by interposing a layer of silk, and blade failures had been practically eliminated. Interest in wood propellers had been revived by the

Schwartz process propeller, developed in Germany, which is used on a large proportion of all British and German military aircraft and is being built under license in numerous countries. It is made of pine or other wood in laminated form, and the blade forms are worked out by hand after the wood has been moderately seasoned. The roots of the blades are of hard wood, impregnated and pressed, a process which makes them so hard that they can be machined like metal and that they will take screw threads, as required for adjustable-pitch propellers. The hard wood root is scarfed to the softer wood of the blade. Next the blade is covered with a layer of fine-mesh wire gauze which prevents splintering, and the leading edge is protected with sheet metal in the usual way. Finally the whole surface of the blade has small holes formed in it, and it is then covered with thick sheets of softened cellulose acetate and placed in a rubber bag from which the air is exhausted. The resulting pressure of approximately 13 lb. per sq. in. forces the cellulose acetate into the holes in the wood and provides the blade with an adherent water-proof coating protecting it against the absorption of moisture.

## I.C.C. Hearings on Local Cartage Areas Under Way

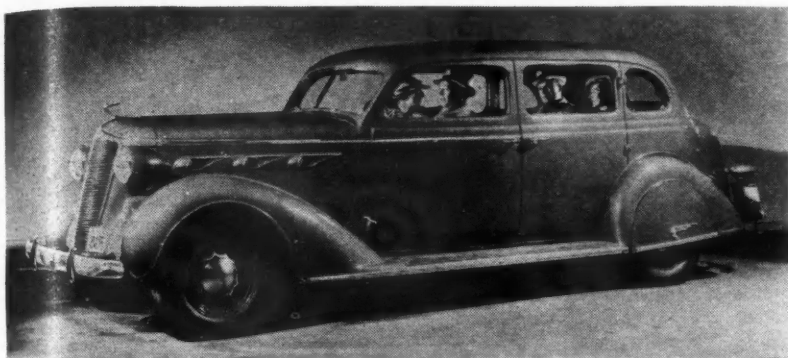
The I.C.C. began hearings last week in New York and Chicago for evidence on which to establish local cartage areas. At each of the hearings, four factions presented their cases and tendered witnesses. They were the railroads, who maintained mostly that metropolitan areas should be construed as railroad switching limits; interstate operators, who asked that corporate limits be established as the basis; cartage operators, who sought to have the limits established as the area with an approximate 50-mile area; and shippers and private carriers for retail stores, who presented evidence showing that custom had decreed substantially what the cartage operators were seeking.

## Hill Diesels Used in Ship Emergency Lighting Units

Seven vessels of the Standard Fruit and Steamship Co. of New Orleans, recently have had emergency lighting units installed, in accordance with a supplement to the rules of the Bureau of Navigation and Steamboat Inspection.

The units consist of a single-cylinder, 5 by 7-in. Hill Diesel engine, direct-connected to a 5-kw., 125-volt, Marble-Card, DC marine-type generator. Engine and generator are mounted together on a rugged cast iron sub-base. The radiator and fan of the engine cooling system are mounted between the engine and generator, to make the unit compact, self-contained and easily serviced.





De Soto's new "Traveler" is a longer and roomier sedan built on a special 130-in. wheelbase chassis. Besides the built-in trunk, extra space for luggage is provided in the rear compartment. The special aluminum-head engine develops 100 hp.

## METALS...

### New Steel Prices Bring Heavy Automotive Buying

With specifications from automobile manufacturers and parts makers furnishing the main support, the steel industry went into high gear in point of production this week. For the first time in about five years, 60 per cent of ingot capacity was reported in operation and rolling, and finishing mills stepped up their production schedules to rates ranging from 70 per cent to capacity. Detroit, Cleveland, Chicago, Youngstown, Buffalo and Pittsburgh districts reported varying increases in mill activities.

With the market as plastic as it was up to March 9, when one of the large "independents" reaffirmed first quarter prices, subject to quantity differentials, it was but natural that announcement of any stand by sellers on second quarter prices would result in considerable covering at old prices, which by reason of concessions turned out to be either lower or the same as the new second quarter price schedule, minus maximum quantity discounts.

On the whole, the new set-up met with favorable reception from representative automotive consumers. These have held for a long time that they should be accorded special price consideration on tonnage business. Steel producers did not seem greatly worried over intimations that smaller buyers would try to get around having to pay more for their steel than do the large buyers, by pooling their purchases. Such a scheme looks much easier on paper than in practice.

Whether the program of forthwith making public any deviations from his price list, to which one producer has pledged himself, will eliminate some of the practices that of late have resulted in a ragged price structure, will depend entirely upon the steel market's morale, and this in turn is predicated on the law of supply and demand. Recent insinuations that automotive buyers of steel were responsible for the

upset in prices through playing one source of supply against the other are lacking in logic. What happened, and what will happen again and again under the same conditions in a free market, was that, in order to get what they think is their fair share of the business overhanging the market, certain steel producers volunteered to make price concessions, rather than have their competitors book all business in sight and leave them out in the cold. The \$2 per ton advance in semi-finished steel prices, announced some time ago, but never having gone into effect, has now been definitely dropped.

**Pig Iron**—In some markets definite an-

nouncement of unchanged prices for second quarter has been made and a little business has been booked. Easier transportation conditions are gradually making for an increase in shipments.

**Aluminum**—The market is strictly a routine affair with prices unchanged.

**Copper**—Steady and unchanged at 9½ to 9¾ cents for electrolytic, delivered Connecticut point.

**Tin**—Consumers have been buying relatively freely in the last few days. Spot Straits tin was quoted at the week's beginning at 47½ cents, a shade higher than at the preceding week's close.

**Lead**—Active and firm.

**Zinc**—Quiet.

### Case Labor Hearing Held Up by U.S. Court

Ferdinand A. Geiger, United States District Court judge at Milwaukee, has temporarily restrained the Regional Labor Board and its director, N. S. Clark, from holding a hearing, set for March 12, on charges filed Feb. 28 against the J. I. Case Co., Racine, Wis., tractor and farm machinery manufacturers, by the International Union of Operating Engineers, Local 309. It was charged that the company had refused to accept the union as the bargaining agent for the employees.

The temporary restraining order was issued when Case petitioned the court for an injunction to prevent holding of the hearing. Until the petition is disposed of, the labor board cannot hold the hearing.

## CALENDAR OF COMING EVENTS

### SHOWS

Switzerland, Automobile Show, Geneva, March 20-29	American Gear Manufacturers Association, Twentieth Annual Convention, Philadelphia.....April 20-21
Hungary, Automobile Show, Budapest, Mar.-April	S.A.E. Production Meeting, Detroit, Mich. ....April 21-24
Illinois Automotive Parts Assoc., Maintenance Exhibit, Navy Pier, Chicago, April 4-8	Natl. Metal Trades, Annual Meeting, New York City .....April 22-23
Portugal, Automobile Show, Lisbon, begins April 16	U. S. Chamber of Commerce, Annual Meeting, Washington .....April 27-30
Yugoslavia, Automobile Show, Zagreb, May 2-11	American Foundrymen's Association 40th Annual Convention, Detroit, May 4-9
Foundry and Allied Industries Exposition, Detroit .....May 4-9	American Petroleum Institute, Mid-Year Meeting, Tulsa, Okla..May 13-15
Spain, Automobile Show, Madrid, May 10-20	National Battery Manufacturers Association, Spring Convention, Cleveland .....May 20-21
International Petroleum Exposition, Tulsa, Okla. ....May 16-23	American Iron & Steel Institute, Annual Meeting, New York City..May 21
Morocco, Fair of Tangiers.....May 16-24	S.A.E. Summer Meeting, White Sulphur Springs, W. Va. ....May 31-June 6
Yugoslavia, 16th International Spring Fair, Lubiana.....May 30-June 11	Automotive Engine Rebuilders Assoc. Annual Convention, Cincinnati, June 1-4
France, Automobile Exhibit at Foire de Paris .....May	American Society for Testing Materials, Annual Meeting, Atlantic City .....June 29-July 3
Norway, Automobile Show, Oslo.....May	National Association Power Engineers, Annual Meeting, Chicago, Aug. 31-Sept. 4
Olympia Motor Show, London, England, Oct. 15-24	American Society for Metals, 18th Nat'l Congress, Cleveland, O.....Oct. 19-23
Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City .....Nov. 30-Dec. 5	American Gas Association, Annual Meeting, Atlantic City.....Oct. 26-31

### CONVENTIONS AND MEETINGS

American Chemical Society, 91st Annual Meeting, Kansas City, Mo....April 13-17	American Petroleum Institute, Annual Meeting, Chicago .....Nov. 9-12
S.A.E. Tractor and Industrial Power Meeting, Milwaukee, Wis...April 15-16	Natl. Industrial Traffic League, Annual Meeting, New York City....Nov. 19-20



Acme Photo

**T**HIS year's Berlin show was again organized on the same large scale as last year's, in the eight halls of the Berlin Exhibition Grounds, and in addition to commercial exhibits it comprised a "Court of Honor"—an exhibit of historic vehicles illustrating the development of the motor vehicle since its inception in Germany 50 years ago. It was exactly 50 years ago when Carl Benz received his first patent for what is considered to have been the first practical motor car, so there were good reasons for an impressive anniversary celebration. This historical exhibit was much appreciated by visitors, whose number is said to have passed the million mark.

Perhaps the outstanding feature of the show was the exhibition of a Diesel-engined passenger car by Mercedes-Benz, a model said to be in production

# Berlin...

at present. Simultaneously the Hanomag company came out with a Diesel engine designed for passenger-car use. As gasoline and its various blends are heavily taxed and cost about twice as much per gallon as fuel oil in Germany, the German buyer naturally views this development with considerable interest. Both companies, however, were rather reticent regarding the innovation and seem to be sounding out the public on it.

Daimler-Benz showed only a single Diesel-engined model, of a type favored

**Reichsfuhrer Hitler officially opens the International Motor Show at the Kaiserdamm in Berlin**



European Photo

**A new German motorcycle with sidecar which is said to run smoothly through any kind of snow. The sidecar is equipped with a ski. It is manufactured by Bavarian Motor Works, Munich**



By EDWIN P. A. HEINZE

**Marks golden anniversary of first Benz patent at its annual Automobile Show. Diesel powered models to meet fuel economy are center of interest. General trend toward four-speed gear boxes.**

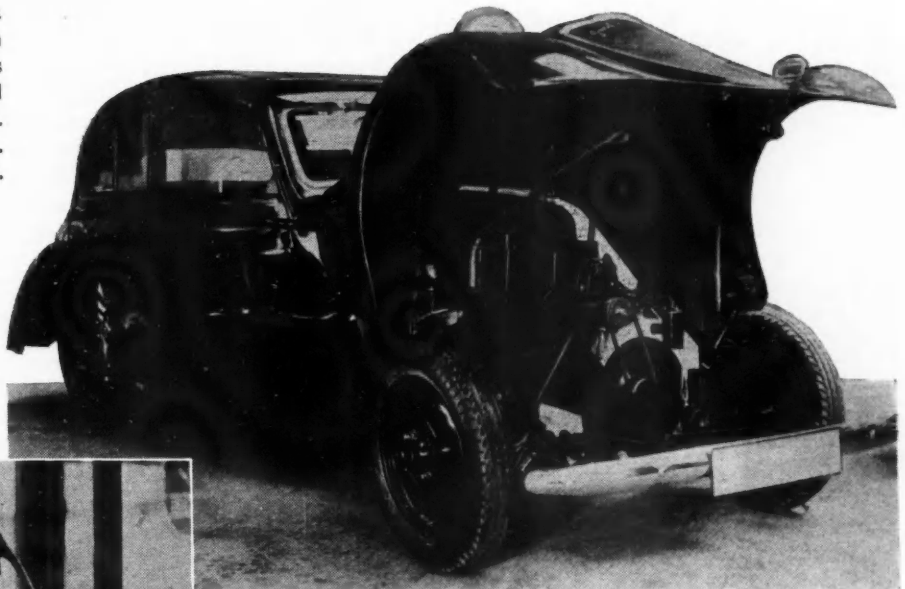
for taxi service in Germany. A trial in the car showed the writer that while the engine is somewhat rougher than a carburetor engine at low speeds, at speeds beyond 35 m.p.h. it is equally smooth, and no one would be able to tell whether he were riding behind a Diesel or a gasoline engine. The Mercedes-Benz engine is fitted to the company's regular 122 cu. in. chassis, with lengthened wheelbase and with a landaulet body seating six to seven adults. The engine has four cylinders of 3.54 in. bore and 3.94 in. stroke, and therefore has a displacement of 158 cu. in. (as compared with the 122 cu. in. gasoline engine of the original design).

It is of the regular Mercedes-Benz pre-combustion-chamber type and develops 45 hp. at 3000 r.p.m. The car is said to have a top speed of 56 m.p.h.

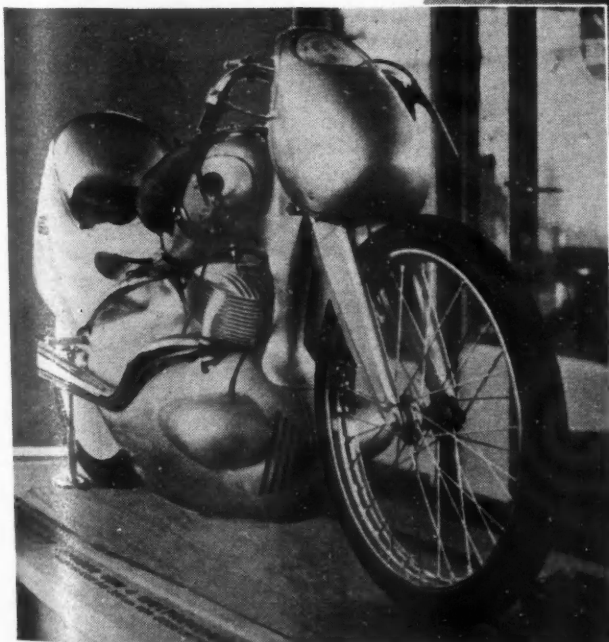
The new Hanomag passenger-car Diesel, which develops 32 hp. at 3500 r.p.m., has a piston displacement of only

100 cu. in., its four cylinders having a bore of 2.91 and a stroke of 3.74 in. The general design is the same as that of the larger Hanomag Diesels of the precombustion chamber type. The engine is offered as an option in place of a 92-cu. in., four-cylinder carburetor

A new feature of construction is incorporated in the new Stoeber car "Greif." The entire hood and mudguards raise and automatically lock in the position shown.



Acme Photo



The new DKW racing motorcycle

European Photo

unit of the same output, in a production model.

Two entirely new Mercedes-Benz models were shown, fitted with the same engine, one having the engine in front, the other at the rear. Remarkable in this case is the reversion from the six-cylinder to the four-cylinder unit. The old six-cylinder engine had a bore of 2.56 and a stroke of 2.34 in. and developed 32 hp. at 3200 r.p.m. with a compression ratio of 5.8 to 1. The new four-cylinder engine has a bore of 2.88 in. and a stroke of 3.93 in. Its compression ratio is 6.2 to 1 and it develops 38 hp. at 3200 r.p.m. The makers

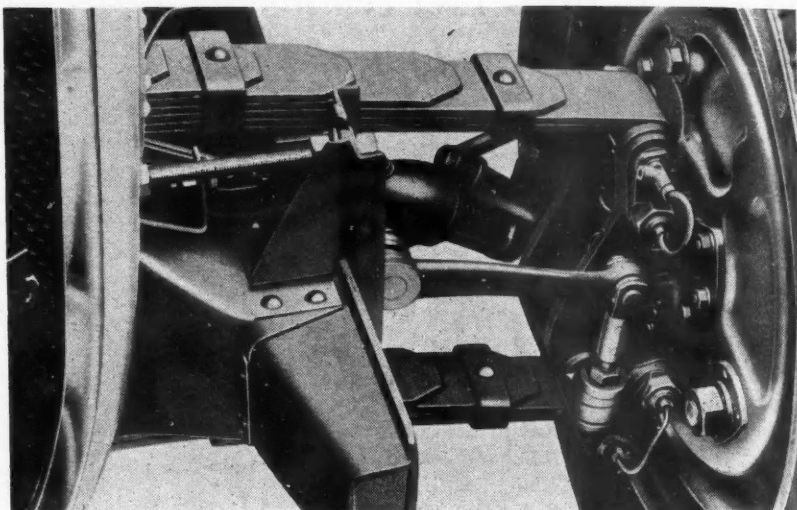
probably wanted a short unit which could be used for the model with the engine in front as well as for the rear-engined car, and they chose the four-cylinder type because the new engine-suspension method by rubber in shear, recently widely adopted in Germany (where it is produced under Chrysler license—Editor), makes a four-cylinder unit practically as smooth and quiet as a six-cylinder engine.

Novel is the light frame of the model with the front-mounted engine. Until now the makers have employed a conventional box-section frame, but there is a trend in Germany towards more roomy bodies, and as, on the other hand, small, economical engines are preferred, it was necessary to save weight wherever possible. The new frame comprises two longitudinal oval steel tubes, shaped to form an elongated X, to which are welded a number of tubular cross members. At the rear the two longitudinal tubes are bent upward, forming a fork that carries a rear cross member, from which the typical Mercedes-Benz swinging axle unit is suspended. The ends of the cross member extend beyond the side rails and rest on the coil springs for the articulated axle housings. The four-speed gearbox with overdrive fourth speed has been replaced by a ZF gearbox with direct-drive fourth speed. Suspension and general equipment otherwise remain the same as on the old six-cylinder model, which is still being built. The weight of the chassis has been reduced almost 180 lb.

The rear-engined Mercedes-Benz is laid out along the same lines as the former model, but it incorporates considerable improvements. It has the same engine as the car just described, which is naturally considerably heavier than the 78-cu. in. engine of the older model.

The cooling is now of the "high-pressure type" originally evolved for the 91-cu. in. rear-engined sports car. It comprises a radiator of small frontal area but deep core, through which air is forced by a blower driven through the generator, which in turn is belt driven. As in the older model, the power is transmitted from the clutch through the hollow, over-mounted worm of the

heater is furnished as standard equipment. As on many German cars this year, the hand-brake lever beside the shift lever has been discarded in favor of the pistol-grip type control under the instrument panel. The rear-engined car is well streamlined and has a top speed of 68 m.p.h. as compared with 62 m.p.h. for the model with forward engine. This model is fitted

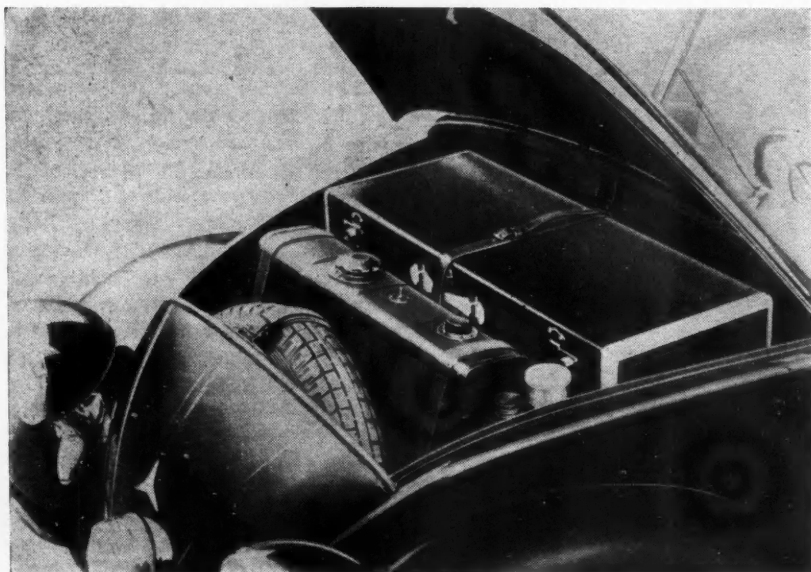


Independent front suspension of Hanomag car

final drive to the four-speed gearbox in front of the latter, whence it is transmitted back to the worm. The suspension remains unchanged, but the weight distribution has been improved, the fuel tank now being located over the front wheels, where there is also a relatively large luggage space and room for the spare wheel. As in a rear-engined car the driving compartment is apt to be rather cool, a car

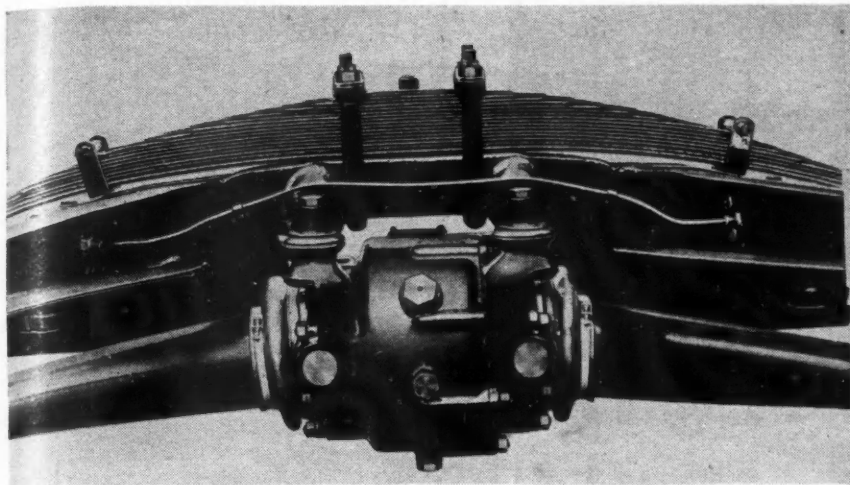
with a third headlamp, mounted low down between the two regular headlights, which floodlights the road directly in front of the car and makes possible safe driving even when the headlights are dimmed.

Up to now the makers of the BMW car have catered to that class of buyers who prefer good acceleration to commodiousness, and built relatively high-powered small cars. As already mentioned, however, German buyers now want bigger cars, and for this reason the firm mentioned has added a new 122-cu. in. model to its line, which meets this requirement. The output of the six-cylinder, valve-in-head engine has been increased from 45 to 53 hp. and the chassis has been redesigned. The body is now very spacious and the sedan weighs 550 lb. more than formerly. Nevertheless the weight per horsepower is only very slightly higher



The compartment under the hood of the Mercedes-Benz rear-engined car accommodates the fuel tank, spare wheel and baggage.





**Independent rear suspension of Hansa 214 cu. in. chassis. Spring bolts and axle tube trunnions carried in Silentbloes**



than formerly. This car has a synchronized four-speed gearbox with automatic free-wheel effective only with the transmission in first or second speed. The tubular frame of the old model has been replaced by a box-section frame. Front suspension is of the independent type, by means of a single underslung transverse spring and one link above the spring on each side, incorporated with the shock absorber.

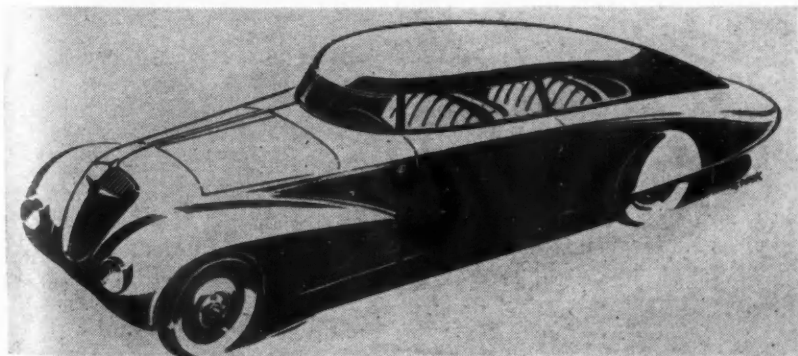
The Hansa-Lloyd and Goliath Works of Bremen, who during 1935 produced a four-cylinder, 66-cu. in. and a six-cylinder, 104-cu. in. model, now have entered the big-car field with a six-cylinder, 214-cu. in. model at a very competitive price. The car has a backbone of box section, forked at both ends. At the front the six-cylinder unit rests on three soft-rubber pads, and the propeller-shaft passes through the hollow backbone tunnel to the differential casing, which is rubber-mounted at the rear. Mounted on top of this gearcase is the transverse spring. The axle shafts are enclosed in housings that are trunnion-mounted on the differential gearcase. The spring is entirely re-

lieved of all propulsion and brake stresses. The front wheels are suspended by parallel links and sprung by inclined coil springs. The floor of the car is very low and there are two deep foot wells in the front compartment on opposite sides of the backbone, which is here widening out to form the front fork. This is the first German car to have a weight-to-power ratio similar to the Ford V-8, which latter is gaining rapidly in popularity in Germany and

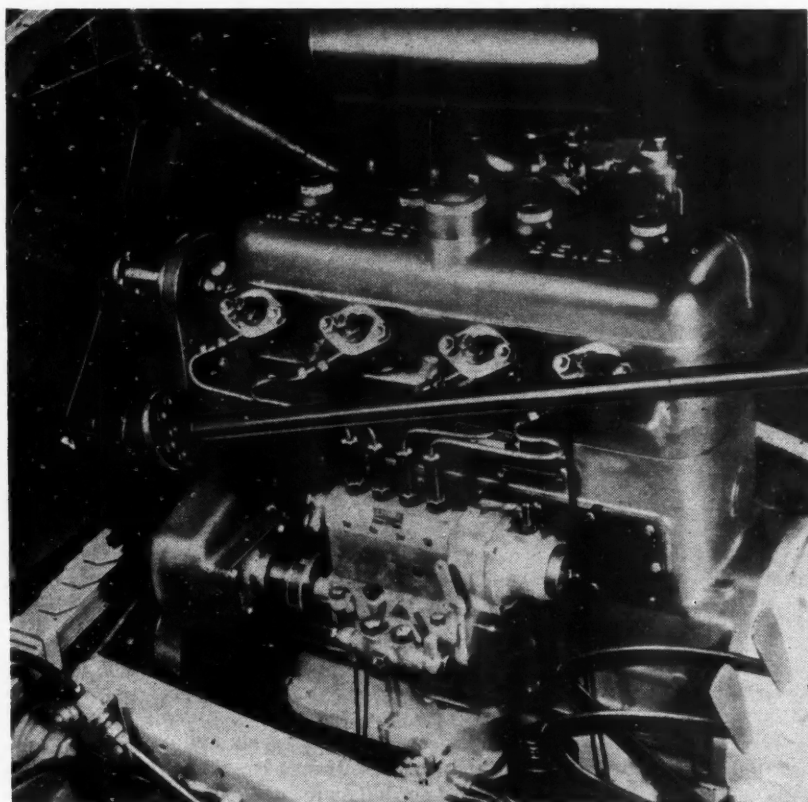
is now being built entirely of German materials. The six-cylinder engine of the new Hansa is said to develop 90 hp. continuously at 3700 r.p.m., on a compression ratio of 6 to 1, while a peak output of 102 hp. is claimed. The engine is equipped with wet liners and has the valves in the head. The Adler Trumpf Junior and the Adler Trumpf, both front-drive cars, are now furnished with more commodious all-steel bodies. In the case of the smaller model the



**(Above) Steyr streamlined small car with four-cylinder opposed front-mounted powerplant**



**(Left) Adler Trumpf with streamlined body built specially for use on super highways**



**Four-cylinder Diesel engine on Mercedes-Benz landaulet chassis**

steel bodies weigh only 45 lb. more than the superseded wood body. It will be recollected that these cars have the frame united with the body, forming a single, self-supporting structure. The maker has tentatively introduced a fully streamlined car on the Adler Trumpf four-cylinder, 102-cu. in. chassis and the engine output has been boosted from 38 to 50 hp. This car is intended primarily for long-distance, high-speed travel on the super highways now being built in Germany, and is capable of over 90 m.p.h.

Only a single new sports car with "high-efficiency" engine was introduced, the Auto-Union's Wanderer, which has a 122-cu. in., six-cylinder, valve-in-head engine with a supercharger of the Roots type and delivers 85 hp. at 4300 r.p.m. It is the normal Wanderer engine with wet liners, having a bore of 2.75 in. and a stroke of 3.34 in. The supercharger is driven through the timing gear, which on this engine is located at the flywheel end. It works continuously and draws charge from a down-draught dual carburetor. At maximum speed it requires 22 hp. to drive the supercharger, so the engine ac-

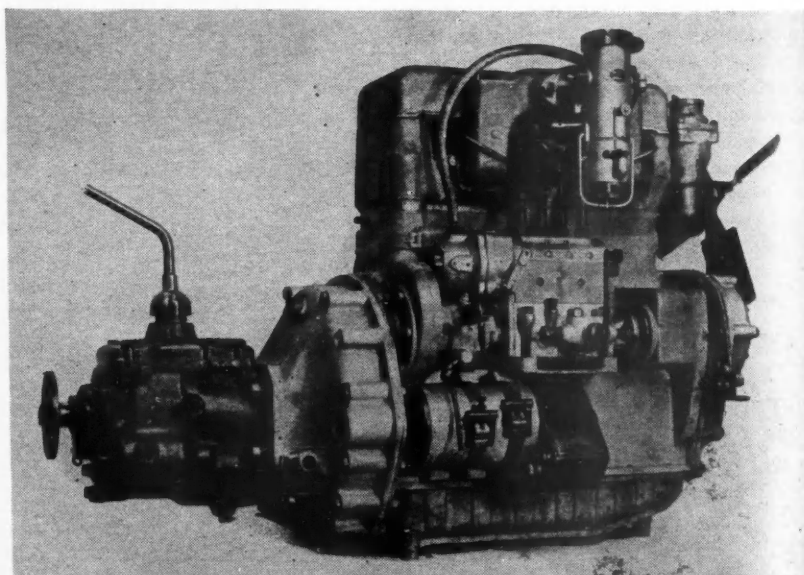
tually develops 107 hp. The car has a box-section frame, and the front wheels are independently suspended by means of two pairs of links and a single under slung transverse spring. Rear wheels are mounted on a rigid axle of the banjo type, with raised spring supports. This brings the single transverse rear spring into the horizontal plane through the center of gravity of the chassis, thus practically eliminating side sway. A feature of the chassis is an automatic chassis lubrication system. The oil tank with pump is mounted

on the frame at the forward end, and the pump lever is extended and rests on the upper wheel link, so that one stroke is performed for each spring oscillation. Calibrated jets prevent over-lubrication. The car has a four-speed gearbox and a final drive ratio of 3.6 to 1, and the two-seater open sports car has a top speed of 93 m.p.h.

Wanderer models now have independent wheel suspension all around, instead of at the rear only, the front suspension being the same as that of the new sports car just described. The rear wheels are carried on torque arms pivoted on the side of the frame and are driven through jointed shafts from the final-drive gear mounted on the frame. The transverse spring, which formerly was mounted under the gear-case, has now been moved further back to increase the road clearance and at the same time lengthen the "spring base."

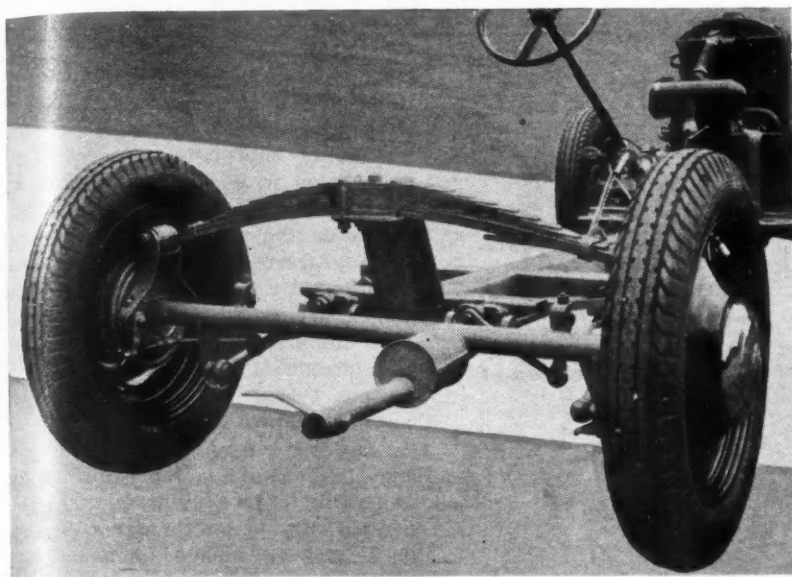
The DKW two-stroke, front-drive cars now have a box-section backbone and the formerly independently sprung rear wheels are now mounted on a tubular axle and have the same kind of suspension as the Wanderer sports car. On the older, 61-cu. in. rear-wheel-drive DKW model the engine output has been increased to 32 hp. A low-priced two-seater model has been added to the DKW line.

Audi front-drive cars of the Auto-Union, which have the same engines as some of the larger Wanderer models



**Hanomag four-cylinder Diesel engine for light vehicles**





**D.K.W. anti-sway rear suspension with single transverse spring at the level of the chassis center of gravity**

(six-cylinder, 138-cu. in.) have independent springing at the front, the system comprising an underslung transverse spring and an upper link on each side.

The Horch line of the Auto-Union now comprises four main chassis models with various modifications. Two are equipped with a V-8, 214-cu. in. engine of 75 hp. and both have independent front-wheel suspension similar to the Audi, but one has a rigid rear axle, while the other has the final-drive gear mounted on the frame and the wheels mounted on a light, tubular axle and driven through jointed shafts outside the axle. The two other models have 305-cu. in., 100-hp., eight-in-line engines with overhead camshaft. One of these has rigid axles fore and aft, while the other, furnished with a sports cabriolet body, has independent front-wheel suspension (two transverse springs) and the same light tubular rear axle and rear suspension system as one of the V-8's.

The Stoewer Company, besides continuing its V-8 front-drive car with 153-cu. in., valve-in-head engine, has taken over the manufacture of the former Röhr Junior, the makers of which suspended operations. This car is similar in design to the air-cooled four-cylinder Tatra, being built under license; a number of improvements were made in the engine, which has new bearings and is said to run much

quieter and to develop more power (36 hp. from 92-cu. in. displacement).

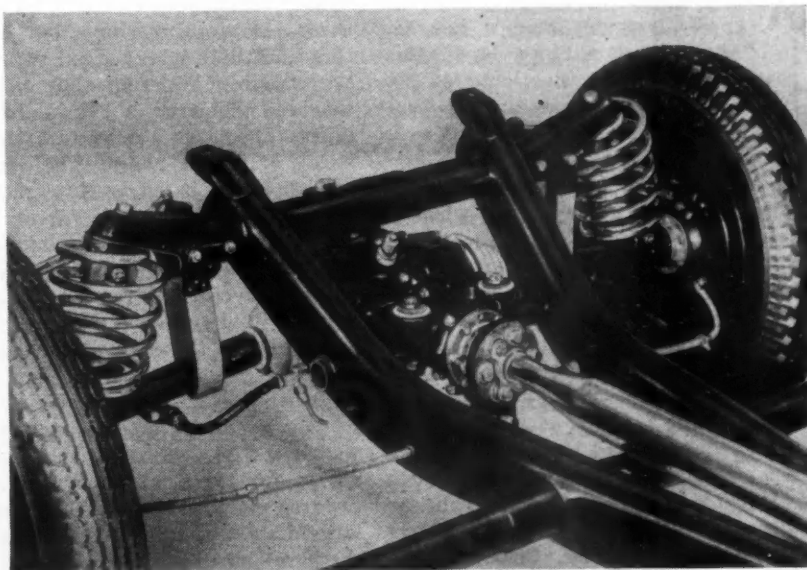
Hanomag has improved all models, and the 61-cu. in. model now has the same type of front-wheel suspension as the others. A very interesting automatic clutch is used which is actuated by oil pressure derived from the engine lubrication system. When the accelerator is depressed, a valve is opened and oil under pressure enters the flywheel through a bore in the crankshaft. The flywheel is provided with a large metal diaphragm, which is acted upon by the oil pressure and then engages the clutch. When the pedal is released, the oil pressure drops and a spring then releases the clutch. This automatic clutch is offered as an option.

The Adam Opel Company, General Motors subsidiary, continues its old models but has added a two-seater to meet the requirements of military or-

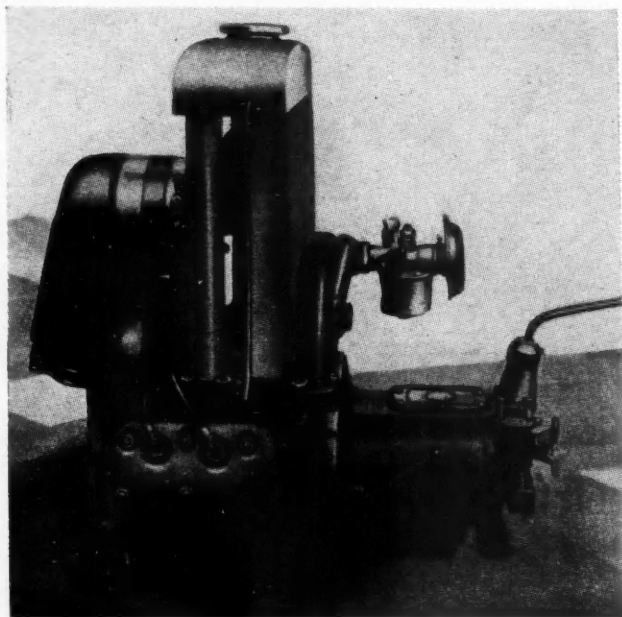
ganizations for cars capable of cross-country operation. The model is developed from the standard six-cylinder, 122-cu. in. production model. The engine has been raised slightly to increase the ground clearance, and care has been taken to so arrange the parts that water cannot cause any trouble when the car crosses shallow pools and rivers.

The Maybach Company has improved its six-cylinder, 214-cu. in. model brought out last year, the engine of which develops 140 hp. at 4500 r.p.m. without supercharger. It has an overhead camshaft and leaf-type valve springs. Its compression ratio is 7.1 to 1. The gearbox is now combined with the engine, and all four gears can be engaged without declutching by setting two small thumb levers on the hub of the steering wheel and releasing the accelerator for an instant, engagement being effected by means of a suction servo unit in combination with the patented Maybach claw clutch in the gearbox. A new model of the same type, with a slightly larger engine (3.54 by 3.93 instead of 3.54 by 3.54 in.), has been introduced. Both engines have wet liners.

The only non-German makers in the passenger-car section of the Berlin Show were the Austrian Austro-Daimler-Steyr, the French Renault, the Italian FIAT and the British Austin. All of the foreign cars shown are already well known, with the exception of one model newly introduced by Steyr,



**Rear end of Mercedes-Benz 170-V chassis, showing X-type tubular frame and rear independent suspension by coil springs**



Steyr power-plant comprising a four-cylinder horizontal opposed engine with radiator directly on top of it

which merits at least a short description. It has a fully streamlined, self-supporting, all-steel body with four comfortable seats and two doors. All seats are within the wheelbase, although this is only 88 in. long. This is due to the use of a four-cylinder, horizontal-opposed, water-cooled engine. The radiator is mounted directly on top of the engine so the water circulates direct from the water jackets through the core. The combined generator and

starter (dynamotor) is mounted on a cradle above the engine in front of the radiator; it carries the fan on its radiator end and receives its drive at the other end by belt from the crankshaft. There is a tunnel inside the body for the propeller-shaft leading to the frame-mounted, final-drive housing, from which jointed shafts transmit the power to the independently sprung rear wheels, which are suspended between the ends of two superimposed, trans-

verse springs. The engine, which has 2.32 by 3.54-in. cylinders, develops 22 hp. at 3600 r.p.m. Its compression ratio is 5.8 to 1.

The general trend of design is toward the use of improved four-speed gearboxes even in cheap models, with at least two speeds of the silent type. Wherever the price admits, synchronized gearsets are employed. In the adoption of this feature Germany has lagged behind other nations, but the Zahnradfabrik Friedrichshafen has this year introduced several interesting new gearbox types, including a four-speed unit with a preselector to be fitted on the steering column and operated by a finger lever on a quadrant which shows which gear is in or is preselected. The selected gear is set through a flexible shaft and is engaged automatically when the accelerator is released momentarily. Another gearset introduced by this company, also of the preselector type, has the gears set electrically and is used in combination with a fluid clutch.

Equipment is improving all around, and even cheap cars are being fitted with central chassis lubrication systems. However, the new Hansa, previously described, is provided with Silentbloc bearings throughout. As regards body design, German designers refrain from too radical departures from the very pleasing older forms, which the German public at least seems to prefer.

## Cummins Has Small Diesel

**A** NEW Diesel truck engine, of smaller displacement than it has had to offer for truck purposes so far, has been announced by the Cummins Engine Company. It is known as the Cummins Model A and corresponds in cylinder dimensions to the light Diesel which was fitted into an Auburn passenger car last spring, with which a demonstration run was made across the continent. In the new truck engine, however, the engine block is an iron instead of an aluminum casting. The engine is a six-cylinder one and has 3½ by 5-in. cylinders, which makes the piston displacement 331.4 cu. in. The output rating is 85 hp. at 2000 r.p.m.

All cylinders and the crankcase are in a single casting of alloy iron, which is provided with removable cylinder liners. The heads for all six cylinders are in a single casting. Pistons are of

chrome-nickel iron and are fitted with three compression rings and one oil ring each. Both inlet and exhaust valves are of a heat-resisting alloy steel and the head diameter is 1½ in. for both types. Lubrication is by force feed by means of a gear pump. The combined pump and fan is driven through a double V belt.

The fuel pump, fuel distributor governor and oil pump are combined in a unit and are of the familiar Cummins design. Fuel and oil filters are mounted directly on the engine. For starting, use is made of electrical equipment comprising a 225-watt, cradle-mounted 12-volt generator and a starter also wound for 12 volts. The engine is designed for three-point mounting.

Seven main bearings of the unusually large diameter of 3½ in. (larger than the bore) support the crankshaft. The

camshaft also is supported by seven bearings, of which one has a diameter of 1½ in. and the remainder diameters of 1½ in. Connecting-rod big-end bearings are of 2½-in. diameter and 2 in. in length. The connecting rod has a center-to-center length of 9½ in. The caps for the main bearings are stiffened by a truss construction and are held in place by alloy-steel studs. Any design of clutch can be accommodated by the fly-wheel.

With all accessories this engine weighs 1200 lb., or 14 lb. per hp. The torque curve is very nearly flat, dropping from a maximum of about 230 lb.-ft. at 1000 r.p.m. to 200 lb.-ft. at 2200 r.p.m., which is still below the peaking speed. The fuel consumption rises from the minimum of about 0.48 lb. per hp.-hr. at 1200 r.p.m. to about 0.56 lb. per hp.-hr. at 2200 r.p.m.



# JUST AMONG OURSELVES

## "Skimmers" Profit And "Filers" Also

**B**EGINNING with the issue of April 4, *AUTOMOTIVE INDUSTRIES* will print once a month, in the first issue of the month, a type of manufacturing story which we believe to be a new departure in editing for automotive executives. The April 4 issue will carry from the capable typewriter of Joseph Geschelin, our Detroit technical editor, a complete analysis of manufacturing philosophy at the great Plymouth plant in Detroit. What are the salient things which make Plymouth one of the most interesting plants in the industry from the point of view? This question will be answered—in copious detail, with two-score pictures of important manufacturing sequences. At key points in the manufacturing operations we shall show transcripts of factory routing sheets, and other factual details of the set-ups involved.

We do not believe that anyone has attempted before to show the amount of detail in automotive manufacturing which will be shown in the Plymouth article and in successive articles in the series. The second article, to appear May 2, will be concerned with the Packard plant, and will describe manufacturing of the

Packard "senior" cars, as well as the "120."

We do believe that every automotive executive who has the slightest interest in the production side of his plant will find profitable reading in the series of production articles to appear in the first issue of each month. We are making every effort to present the articles in such a way that they will be easy to read and be of value to the "skimmer" as well as the more serious reader. We hope you like them.

## Another Thing We Think You'll Like

**I**N our *second* issue of each month we shall introduce, with the issue of April 11, a feature of an entirely different character. From the tables of mechanical specifications of motor vehicles which have been for many years of recognized interest in the annual statistical issue of *AUTOMOTIVE INDUSTRIES*, we have selected the table of most general interest, that applying to the specifications of passenger cars. These specifications will be brought up to date each month, checked and rechecked, and printed as a two-page feature in the *second* issue of each month. As they appear we shall be glad to have your comments and criti-

cism of the matter included in the specifications, and suggestions for other material of a like nature which might be included.

## A Safari Begins In Wildest Can.

**M**UCH has been written about the common interests and the common heritage of the peoples of the United States and the Dominion of Canada. A recent news report from the Dominion indicates that the sport of legislative head-hunting must find its place in the heritage classification.

It seems that the Canadian farm-implement industry has not seen eye to eye with the Government on every occasion. While the Liberal ministry, in its early days, was trying to get tariffs reduced and attempting to lower production costs, the wicked farm-implement industry found it necessary to increase prices.

Outraged agrarian liberals from the western Provinces have launched a movement to have the farm-implement industry "investigated" by the House of Commons Committee on Agriculture. The objectives of the committee, so the story goes, will be to discover inefficiency or concealed profits in the business of manufacturing machinery for the humble farmer and failing either of these, to unearth evidence of national or international combination. And we might add, if the investigation follows classical lines, to discover practically anything else from which political capital can be made.—H. H.

# "Fast, Foolproof and

**S**INCE the introduction of the Pratt & Whitney Electrolimit gaging system it has been applied in many places in the automotive industry for fast, fool-proof and precise measurement and inspection of close-tolerance parts in the production department.

One of the most comprehensive installations of Electrolimit gages, illustrating the full breadth of its flexibility is found at Plymouth Motor Corp., in Detroit. A battery of these gages is found in the new piston department for inspection of wrist pin bores, and the grading of pistons by variations in the outside diameter; while two other instruments are used for the grading of cylinder bores to match pistons precisely. These gages control the entire volume of Plymouth production.

Although the Electrolimit gage offers the possibility of measurements to any desired degree of accuracy—at least of the order of one-hundred thousandth of an inch—its fool-proofness and dependability are proved by the fact that it is no longer a laboratory instrument but has been freely adopted for routine production inspection. The equipment is free from outside disturbances such as vibration, dirt and dust and the absence of moving parts makes its use possible for continuous production without the need for constant attention.

The human element is said to be entirely eliminated, thus making it possible to get precise grading and measurement with unskilled help. By using a remotely controlled dial it is possible to get any degree of amplification with wide zones for grading, as evidenced by the equipment used by Plymouth. Incidentally, the large scales for fine tolerances eliminate eye fatigue and assure accuracy while working at full production speed.

The two cylinder bore gages taken at the inspection station at Plymouth are shown in the illustrations. Bores are graded A, B, C, D, the visual meters being marked in zones indicating the precise grade for each bore. As shown, the operator uses a hand tool with a pistol grip, the measuring device and grade meter being located at a remote point but electrically connected with the gaging head. The gage not only gives the grade, indicating the diameter of the bore, but can be used for taper and out-of-roundness.

Another view shows a close-up of a similar device used in grading pistons to match the bores. Here the meter shows clearly the zones for grade selection. Over at the left of this illustration will be seen several partitions fitted on the table, one for each grade. The operator simply rolls the piston into the proper compartment as the grade is indicated by the gage.

With the aluminum pistons used by Plymouth, it has been found that pressure is an important consideration in gaging since excessive pressure may easily distort the outside diameter and produce an error in grade. Consequently, the machine has been so designed that readings are taken with a measuring pressure of only four ounces.

The third application, is that of checking the wrist pin bore. Here the operator gets a direct reading of size which must be within the limits shown on the dial. The entire scale bounded by the figures seen here covers only 0.0004 in. This hole is held within 0.0002 in. and amplification is of the order of five thousand to one since one-tenth on the product equals a scale reading of  $\frac{1}{2}$  in. on the dial.

The general view in the piston inspection department shown is interesting. The instrument at the extreme right checks the wrist pin bore. The three stations at the left are for grading piston O.D. Note the partitions at each inspection station to accommodate pistons of the same grade.

Because of the fineness of the measurements, temperature of the parts checked play an important role and must be held under control. For this reason, the master rings used for setting the cylinder bore gages are kept in a special cabinet at a constant temperature.

Only two Electrolimit gages are required for exploring and grading cylinder bores at Plymouth. Visual gage set remotely in front of operator indicates the marking of the bore and checks for roundness and taper.

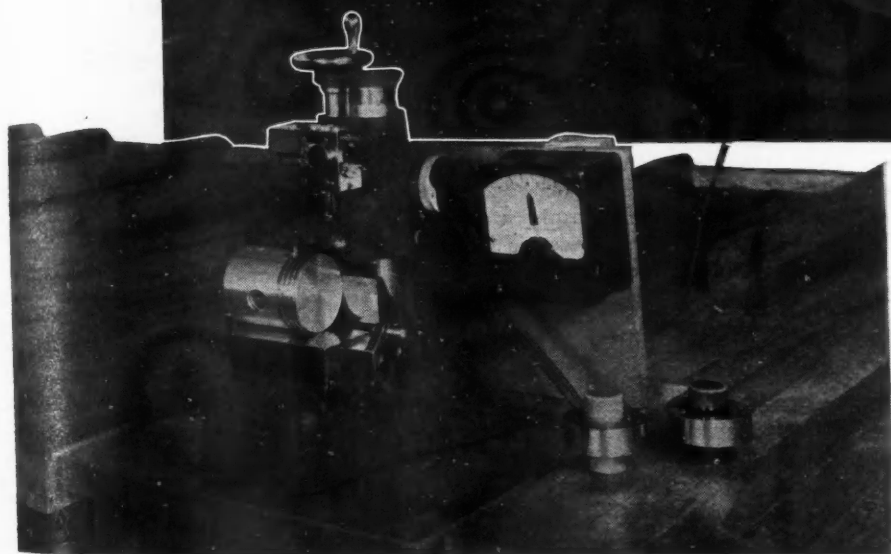
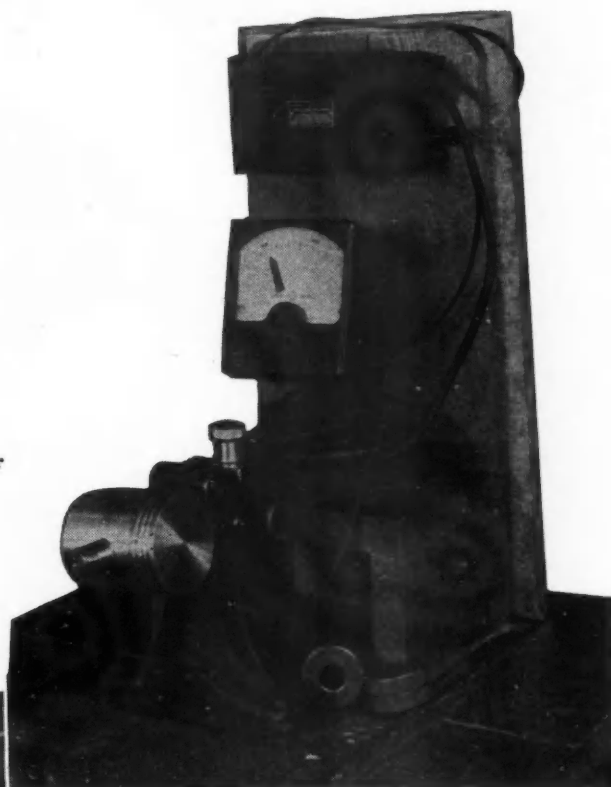


# and Precise" . . .

*Electrolimit gages keep Plymouth pistons and cylinder bores within narrow tolerances*

This instrument is used for gaging wrist pin holes.

General view of piston inspection department showing three O.D. grading instruments and the wrist pin machine at the extreme right.



Close-up of one of a battery of three Electrolimit gages used for grading pistons. Gaging pressure is only four ounces to guard against distortion of piston wall.



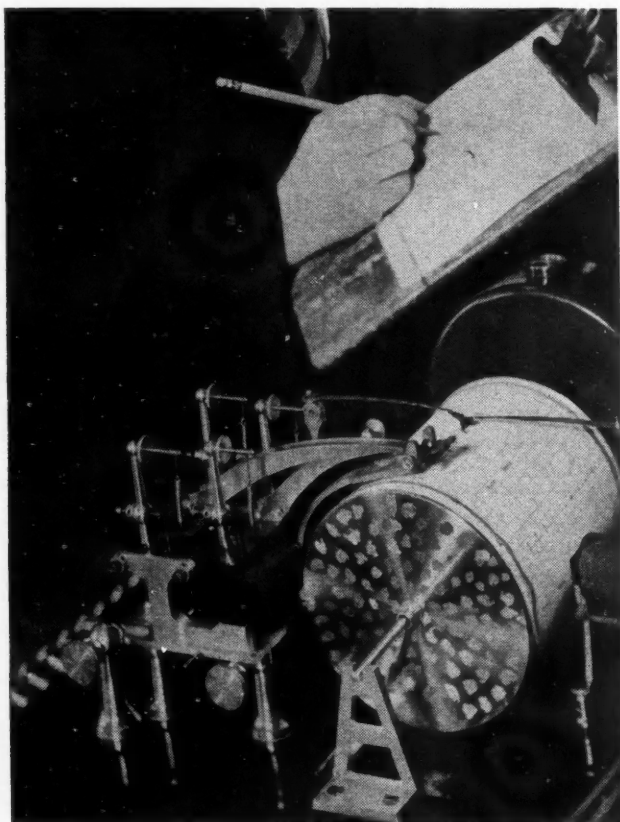


Photo by Howard Kohlbrenner, Chilton Co.

# Does Specific Fuel Correction for

By P. M. Heldt

IT has long been customary to correct the results of dynamometer horsepower tests "to standard atmosphere." For instance, if the engine during the test is operated in "thin air," due to either low atmospheric pressure or high temperature, the horsepower developed is less than it would be in an atmosphere of standard density, and it is for this reason that the correction factor is applied. It has been found that the output of the engine varies substantially as the atmospheric pressure and inversely as the square root of the absolute temperature of the atmosphere. Of course, the atmospheric density has a direct influence only on the indicated horsepower; friction losses within the engine are not affected by it to any notable extent, but these losses usually are only small compared to the indicated horsepower, so it seems reasonable to assume that the brake horsepower varies in direct proportion to the indicated horsepower and is affected in the same way by atmospheric changes. The general formula for the correction factor for atmospheric density is

$$f = (29.92/P) (\sqrt{T/520})$$

where  $P$  is the atmospheric pressure in inches of mercury column at the time the test is made, and  $T$  the absolute temperature in deg. F. The measured horsepower is multiplied by this factor to obtain the horsepower which the engine would produce in an atmosphere of standard density under otherwise similar conditions.

The question has repeatedly come up as to whether a similar correction should be applied to the specific fuel consumption determined under other than standard conditions of atmospheric density. The specific fuel consumptions for the atmospheric conditions under which the test is carried out is readily determined by measuring the fuel consumption of the engine per hour and then dividing this by the number of horsepower delivered by the engine. If the engine consumed exactly the same amount of fuel under standard atmospheric conditions but developed a different output in accordance with the correction factor, then it would be permissible to apply the correction factor also to the specific

fuel consumption, using it as a divisor instead of a multiplier.

A good deal evidently depends on just what is meant by "under otherwise similar conditions." As regards the fuel supply, it might mean one of three things. It might mean with the same rate of fuel supply to the engine; it might mean with the same carburetor setting, and it might mean with mixture of the same quality (the same mixture ratio).

Now, it is quite unreasonable to expect the engine horsepower to increase in direct proportion to the amount of air supplied if the fuel supply is not increased. In fact, the increased air supply can result in an increase in power output only because it is capable of burning a larger amount of fuel, and if the fuel is not supplied the increase in power will not be obtained. This eliminates the first of the three possibilities.

If no change is made in the carburetor setting (the size of jet used or the adjustment of the gasoline needle valve or other means for controlling the fuel flow), then the quality of the mixture or the mixture ratio will vary with the density of the air at the carburetor inlet. The rate at which air passes through the carburetor (in weight/time units) depends on both the atmospheric pressure and the atmospheric temperature. In fact, the correction factor for engine horsepower is based on the equation for rate of air flow through a throat (carburetor venturi), which is as follows:

$$w = \frac{2.04 C p a_1}{\sqrt{T}} \sqrt{\left[\left(\frac{p_1}{p}\right)^{1.42} - \left(\frac{p_1}{p}\right)^{1.71}\right]}$$

lb. per second

where  $C$  is the flow coefficient of the throat (usually of the order of 0.85);  $p$ , the atmospheric pressure in lb. per sq. in.;  $a_1$ , the area of the throat in sq. in.;  $T$ , the atmospheric temperature in deg. F. absolute; and  $p_1$ , the pressure in the throat of the carburetor in lb. per sq. in.

# Consumption Need Atmospheric Conditions?

In a carburetor installation, with the engine operating at a given speed and with a given throttle setting, the throat pressure  $p_t$  will be a definite fraction of the atmospheric pressure  $p$  regardless of the value of the latter. Therefore, in the above equation for rate of air flow, the fraction  $p_t/p$  is constant and does not change with the atmospheric pressure. That means that the term in brackets is constant and that the rate of flow varies directly as the atmospheric pressure  $p$ , which appears in the numerator of the fractional coefficient of the expression for rate of flow. Therefore, the amount (mass) of air drawn in by the engine during one cycle goes up and down in direct proportion with the atmospheric pressure.

It is also evident from the above equation that the amount of air which enters the cylinder per cycle is dependent on the absolute temperature  $T$ . It varies inversely as the square root of the absolute temperature.

There is evidently complete agreement between this equation and the correction factor, according to which latter the horsepower varies directly as the atmospheric pressure and inversely as the square root of the absolute temperature.

Now let us see how changes in atmospheric conditions affect the rate of gasoline flow from the carburetor nozzle. It is generally assumed that the flow of fuel through the metering orifices of carburetors is of a turbulent character, since the metering orifice is quite short, the velocity of flow is relatively high, and the fuel has a low viscosity. In turbulent flow the rate is proportional to the square root of the pressure difference which causes it. This pressure difference is the difference between the atmospheric pressure, which acts on the fuel in the carburetor bowl, and the throat pressure effective at the nozzle outlet. It was shown in the foregoing that this pressure difference, for constant engine conditions, is directly proportional to the atmospheric pressure or carburetor air-inlet pres-

sure, hence the gasoline delivery goes up and down in direct proportion to the square root of the atmospheric pressure.

As the air delivery varies in direct proportion to the atmospheric pressure and the fuel delivery in direct proportion to the square root of the atmospheric pressure, it follows that when the atmospheric pressure changes, the mixture ratio also changes. This may seem a contradiction of claims frequently made by carburetor manufacturers, at least in the past, that their carburetors deliver a uniform mixture under all operating conditions. However, where this claim was made it was intended to cover only operating conditions as affected by engine speed and throttle position, and not changes in atmospheric density. That the ratio of mixtures delivered by ordinary carburetors changes with atmospheric conditions is well known to aircraft engineers. With increase in altitude, that is, with a decrease in the density of the air, the richness of the mixture increases, and vice versa, and an altitude correction is provided in modern aircraft carburetors to take care of this condition.

As regards the atmospheric temperature, it is obvious that this cannot have any noteworthy effect on the fuel delivery. If the atmospheric temperature rises the cylinder gets less air per cycle, but it does not get any less gasoline.

Therefore, the mixture ratio changes also with the temperature.

Whenever there is a change in the mixture ratio there is also a change in the thermal efficiency, that is, in the horsepower developed for a certain rate of fuel consumption. We expect the horsepower to go up in direct proportion to the rate of air flow into the engine, this expectation being implied in the use of the horsepower correction factor. The horsepower evidently will go up in this proportion if the fuel delivery varies in the same proportion as the air delivery, so that the mixture ratio and the thermal efficiency remain constant. The use of the correction factor for horsepower, therefore, really implies a constant thermal efficiency, which in turn implies a constant mixture quality.

The conclusion is that in order to obtain the "corrected horsepower" under standard atmospheric conditions, the engine would have to be supplied with a mixture of the same quality as used in the test, and the specific fuel consumption would then be the same as in the test. Consequently, specific fuel consumption does not have to be corrected for atmospheric conditions. The result obtained by dividing the observed fuel consumption by the observed horsepower is the correct specific fuel consumption, not only for the atmospheric conditions under which the test was made but also for standard atmospheric conditions.



If an engine is tested in "thin air," due to low atmospheric pressure, the horsepower is less than it would be in an atmosphere of standard density

# The Horizons of Business

by Joseph Stagg Lawrence

## War Scare in Retrospect

**M**ANY are perplexed by the action of the stock market in the face of a war scare. On Thursday and Friday of the past week when the probability of war appeared greatest the entire market sold off sharply and some of our leading issues dropped five and six points a day. Precedent and reason seem to be in conflict in indicating the course which the market should follow. Precedent shows that war causes a strong reaction in our security market. In 1914 the American market closed and for a brief period behaved as though the land had been overtaken by a major economic catastrophe. During the past week the reaction was similar though vastly more moderate. This does not seem to make sense. The good burgher knows that war stimulates the demand for goods. Industry, particularly that part of it which ministers to Mars, receives an abnormal stimulus which the security market ultimately reflects.

### Vital Security

It is one of those situations in which both precedent and reason are right even though they appear to be in direct conflict. A security market, not unreasonably, thrives best in an atmosphere of security. Security is as essential to stocks and bonds as sunshine and moisture are to living organisms. The price paid for a share of X is the discounted present value of an infinite series of annual incomes which it anticipates. If there be any doubt about this, compare the price of any stock with its prospective earnings. The correlation between these two variables, market price and earnings, is as convincing as any relationship in the field of economics. In order that future income may have present value it must be certain. To the extent that certainty is impaired present price will suffer.

During 1934 and the first months of 1935 American business and security prices failed to make progress, though the tide of world business was strongly upward. In that period Washington unquestionably provided the hazard which

prevented business men and property owners from taking reasonable risks and accounted for the stalemate in the security market. The public simply did not know how certain the future returns on capital were. For a brief period during the past week Europe was the boogy man. An egomaniac was flicking lighted matches into a powder-laden arsenal. Any moment a bit of exposed TNT might ignite and the world would be off on another horrible jag of blood and desolation. Such was the broad reason for the nervousness of the market.

### Foreign Holdings

There is another reason, a more technical reason. During 1934 and 1935 the rest of the world sent \$2,871 million of gold to the United States. The orthodox economist says that gold moves from areas of low to areas of higher value. It is a freely moving material embodiment of value which is constantly seeking levels of maximum esteem. In this instance the explanation does not go far enough. Gold moves from a lower to a higher level of value only if the condition of security is the same. If there is any marked variation in security, gold will move from a less to a more secure locale. Compared to capital the hare is a veritable demon of courage.

During the past two years the bright prospects of American business constituted one of the reasons why capital flowed in such great volume to America. More important than current and prospective rates of return was the greater security which American investment offered. The cynic may well reflect upon the low state of security in other parts of the world if such a conclusion is correct and with that reflection we shall not quarrel.

We can best emphasize the importance of security by posing this question: If you had a million dollars would you invest it where you had a reasonable assurance of a ten per cent return in the face of a fair chance that you might lose much or all of your million-

dollar principle, or would you place the fund where your return might be negligible, even zero, but your principle reasonably secure? If you have only \$10 you may not know the answer, but if you have a million you do. That is why so many millions came to the United States during 1934 and 1935.

### A Monopoly on Information

We do not know where these many immigrant millions came to rest. The Federal Reserve Banks know. If you ask an F.R.B. official he will tell you that the figures are compiled for the U. S. Treasury and are available to no others. Therefore we can only make guesses. Before George N. Peek retired he turned in a craftsmanlike study of the international balance sheet. The Department of Commerce publishes an annual statement covering the complex flow of goods, services and capital items. It tells us little about the foreign ownership of American securities. The movement of gold during the past two years and the available data on the international account suggest that aliens hold approximately seven billions in America which may be regarded as liquid and that from three to five billions is in the form of securities. Obviously any substantial liquidation of such holdings would produce a severe reaction in the American market. It is the possibility of such liquidation superimposed upon the threat to security which occasioned the nervousness of the past week.

### Manipulation from Abroad

There is an additional reason which throws a curious light upon the effect of the Security Act of 1933 and the Security Exchange Act of 1934. These laws seriously cramp the style of the market speculator. The visitations of the SEC's agents are penetrating and at times embarrassing. They are a nuisance even when the witness has clean hands. Wall Street is no longer a healthy rendezvous for the old style manipulative freebooter. He now operates from a distance in a more tolerant purlieu. There is a substantial volume of in-and-out trading from London. No

(Turn to page 453, please)



# A Fuel-Oil, Spark-Ignition Engine Developed in Finland

**A** LOW-COMPRESSION, fuel-oil, spark-ignition engine has been developed in Finland by the Ares Motor Company. For the following description of this engine we are indebted to one of our Finnish readers, Hans A. Branders of Warkaus.

In this engine the fuel is injected directly into the combustion chamber by injection equipment similar to that used with Diesel engines, and the engine therefore is of the same general type as the well-known Hesselman. It differs from the latter in that it is provided with a fuel vaporizer located within the cylinder proper. This feature is covered by patents issued in Finland and other countries.

The vaporizer, which consists of a ring provided with helical baffles, is held between the cylinder and cylinder head (Fig. 1). The baffle ring imparts a swirling motion to the air during the suction and compression strokes, and it also functions as a heat-storage member, absorbing heat during the combustion period and giving it up to the combustible charge during the compression stroke, thus helping to vaporize the fuel. The spray nozzle is located centrally in the cylinder head. Fuel is injected before the piston reaches the end of the up-stroke, and the spray is directed radially outward, in a very flat cone, toward the baffle ring. It first encounters the heated swirling air and is partly vaporized by it, and the remainder strikes the heated baffle ring, which completes the process of vaporization. Mixture of air and fuel is therefore very thorough and the

mixture is readily ignited by the spark plug. The baffle ring reduces crankcase dilution to a minimum, as it prevents raw fuel introduced when starting from cold from running down the cylinder walls.

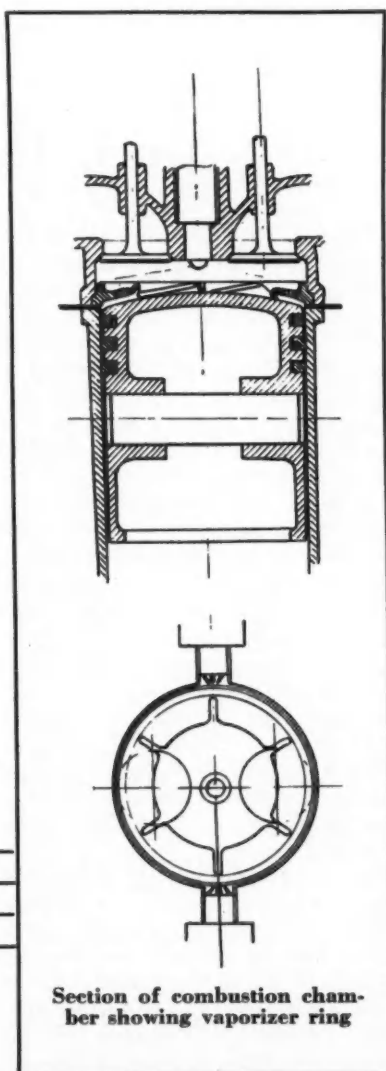
About a year ago thirty engines of this type were installed in ten patrol cruisers built for the Finnish Coast Guard. Each boat carries a pair of eight-cylinder 520-hp. engines and one

six-cylinder 180-hp. engine. In the official tests, made by the Finnish Government before the engines were accepted, the specific fuel consumption ranged between 0.42 and 0.48 lb. per hp-hr. The tests extended over 48 hours, during one-half of which period the engines were run under full load. The engines were idled at 250 r.p.m. for two hours without trouble.

The larger engines have a bore of  $7\frac{1}{2}$  in. and a stroke of  $9\frac{1}{2}$  in. (appr.) and develop 520 hp. at 1200 r.p.m. Ignition is dual, by Bosch magneto and battery. Under part load, both air and fuel charges are reduced, by means of an interconnection between the Bosch fuel pump and the air throttle. Each cylinder has two inlet and two exhaust valves, which are operated through pushrods from a camshaft in the crankcase. The compression ratio is 6.2.

The smaller engines are similar in design, with a bore of  $6\frac{1}{2}$  in. and a stroke of 7 in. (appr.). They develop 180 hp. at 1150 r.p.m. An eight-cylinder model with the same cylinder dimensions is also being manufactured, and develops 240 hp. These engines are offered also in designs suitable for stationary and rail-car applications.

Experiments have been carried out by the Ares Motor Company with the vaporizer installed in aviation engines. A Cirrus engine has been run with fuel oil with excellent results. Idling speeds as low as 200 r.p.m. were obtained without trouble, and maximum speeds of 2000 r.p.m. were maintained continuously.



# The FORUM—

## Spiral-Bevel Gear Durability

Editor, AUTOMOTIVE INDUSTRIES:

I am taking the liberty of approaching you with respect to the review on the durability, etc., of spiral bevel gears for automobiles in your magazine by J. O. Almen.

In investigating the questions of noise and gear failure, I have not been able to approach the problem as thoroughly as the author of the paper, but I have certainly arrived at the same general conclusions in the minor points concerned with the effect of deflections, etc., on noise, bearing durability, and gear durability.

During these investigations, I have also considered the effect of using a right-hand spiral instead of the more usual left-hand spiral, and this appears to offer a number of most desirable features in the whole assembly. In the first case, the loads as regards thrust are much lighter on the bearings, while the stresses in the pinion and differential mounting are much more favorable in that they are imposed upon the solid mass of the housing rather than upon the caps in the case of the differential, and the end cap in the case of the pinion.

I should be very interested in any comments you could let me have regarding the question of right-hand spiral, as from a casual point of view one would imagine that this was an entirely incorrect method of attack in view of the fact that practically everyone uses left-hand spirals. I do know that one motor manufacturer in England uses the right-hand spiral and I have some recollections that in one or two isolated instances a similar practice is carried in the States, and I should be greatly obliged for any comments you could make, however brief, as I feel that you are in a far better position to consider this.

I. O. HICKLING, A.M.I.A.E.,  
Nottingham, England.

We submitted the above inquiry to the Gleason Works, on whose special cutting machines most spiral-bevel gears are produced, and had the fol-

lowing reply from A. L. Stewart, chief engineer of the concern:

"\* \* \* The general practice for spiral-bevel gears in rear axles is to use left-hand spiral. This practice became almost universal soon after the introduction of spiral bevel gears over twenty years ago, the reason being that the thrust load due to spiral angle on forward drive tends to force the pinion away from the gear. If any play develops in the pinion mounting, the result is merely an increase of backlash, whereas with right-hand

spiral the pinion would force into the gear. In the early days a few right-hand spiral jobs actually suffered breakage due to this wedging action, and right-hand spiral was quickly dropped. Left-hand spiral, once adopted, has persisted.

"With the improvement in bearings and mountings over the intervening years, however, the picture is changed, so that now we should not hesitate to recommend right-hand spiral or to approve it wherever there is any reason for it; provided, of course, the mounting is properly designed and bearings are properly selected.

"There are a few American axles in development today, both passenger car and truck, in which the pinion tends to pull into the gear on forward drive, and so far as we know they are entirely satisfactory in respect to this feature."

## More About Safety

Editor, AUTOMOTIVE INDUSTRIES:

SAFETY CAMPAIGNS about which so many words are written and so little is accomplished, affect all of us whether we drive or dodge cars. A perusal of Mr. Geschelin's "Accent on Safety," in a recent issue, and of Secretary Roper's remarks on the subject arouses me to a somewhat different view of the problem.

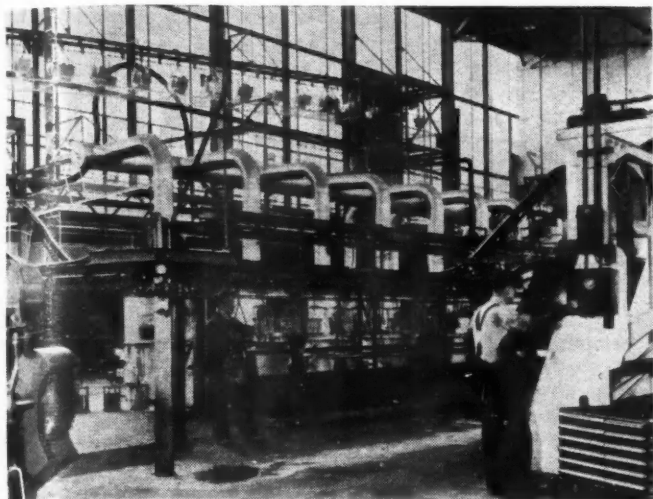
Surveying the situation with the viewpoint of an engineer outside the domination of the automobile makers, with a background of 23 years' experience with cars in this and foreign countries, I agree with Mr. Geschelin that speed *per se* is not an important factor in the problem of safety. Mr. Geschelin states, "It has to do first with human beings." Apparently little attention has been given that aspect of a serious accident situation that is going to hamper the progress of the automobile industry.

Perhaps some thought should be given to the reaction of the average person when the control of power enables him to express his assumed personality. We can appraise some of the results in the case of certain dictators. Observe the number of inferiority complexes driving in the left

traffic lane, parking on curves or at intersections, flouting all requirements as to signals and respect for the rights of others, and it will be apparent that the psychological aspect of the safety problem woefully lacks attention.

May I cite a flagrant example of neglect and carelessness in treating this subject of safety? A pamphlet titled "We Drivers" has been copied in magazine articles by so-called authorities on traffic problems, such as Gov. Hoffman. The first item treats of passing cars, and presents a most startling inaccurate picture of what it means to pass a car going 40 m.p.h. I quote, "When we try to pass a car that's going forty miles an hour, it's just the same as if we tried to pass a standing string of cars 126 feet long." "If we try to pass one going sixty, it's like trying to pass a line of more than sixteen cars standing in the road, and sixteen cars in a row will reach half a block." Shades of the Proving Grounds and the Research Staff, could the subject be treated more inadequately, or more calculated to cause more morons to attempt to pass, with cars having, say, a capability of 42 m.p.h.!

(Turn to page 450, please)



Metal working plants, formerly dark and gloomy, now may be as light as day. Here is a section of Chevrolet's heat treating plant at Saginaw, where the walls are virtually all glass from ground to roof.

## PRODUCTION LINES

### Bright Plating

Dr. William Blum, electroplating expert for the U. S. Bureau of Standards, made a flying trip around the circuit recently and addressed Detroit Chapter of the American Electroplaters' Society at its March meeting. He spoke in the interest of the tentative specifications adopted last year in cooperation with the ASTM and pointed out that the thickness of the plated coatings is the most important factor in corrosion resistance. The present tentative specs are based upon minimum thickness of plate and not the average thickness as heretofore. Moreover, two grades of plating are now recognized—general outdoor with minimum thickness of 0.00075 in. of nickel and chromium; and mild indoor with minimum thickness half of this figure.

\* \* \*

Zinc and Cadmium plate is specified as minimum thickness of 0.0005 in. for general and 0.00015 in. for mild exposure. A new B. of S. publication on tentative specifications is now available and may be obtained by asking for R.P.867. A new project is under way for testing plated specimens of non-ferrous base materials such as copper, brass, zinc, die castings, and nickel-brass.

\* \* \*

At the present time the accepted method of testing plated coating thickness still is that of microscopic examination of strips cut from the plated specimen. However, the Bureau is experimenting with the "chord" method in which the plate is removed down to the base metal by means of a grinding

wheel and the depth estimated from the geometry of the cut. The familiar mathematics as well as other complete details of the new method are described in a new publication of the Bureau—R.P. 866—which is ready for distribution.

\* \* \*

While the heavy bright nickel coatings still are in the experimental stage in this country, they have been in regular use in Europe for several years. European practice is to plate around 80 amp. per sq. ft., in most cases with air-agitated, filtered solutions. Dr. Blum made an eloquent plea for cooperation of industry with the tentative specification project since such specs are meaningless unless they are thoroughly tested in actual production and revised according to experience.

### How Efficient

In the selection of new equipment the wise production man has learned to question the difference between productivity estimates and actual efficiency of the machine. It is possible, of course, to drive any machine beyond its most economical speed but how long it maintains that pace is a moot question. Most machinery manufacturers play safe by rating productivity at an efficiency of around 85 per cent. A safe rating means the assurance of uninterrupted performance which after all is the most important consideration.

### Bright Nickel

One of the important figures in the plating field has developed a method for

producing bright nickel coatings of greater thickness than has been practical heretofore. There have been bright coatings before but as we understand it, they were not sufficiently thick. This should be good news to the metallurgists and others concerned with the production of fine bright chromium finishes having the desired corrosion-resistant properties.

### Practical Usage

A new type of data sheet is being issued by United Chromium, Inc. It's a series on industrial applications for chromium plating and is indeed a unique service for production men. The "IP" bulletins give complete reports on new applications of chromium plating on tools and wearing parts and will keep you informed as to the latest developments in this field.

### Real Inhibitor

A new pickling inhibitor known as Ferritrol No. 100 is announced in the current issue of *The Houghton Line*. Among the advantages claimed for this material are that—

"It permits the scale to be pickled off, stops pitting and excessive consumption of acid, stops evolution of hydrogen, prevents formation of smut on surface of steel, does not permit acid fumes to escape into the atmosphere, does not break down at 220 deg. F. (104 deg. C.) and leaves a chemically clean surface."

### With Nickel

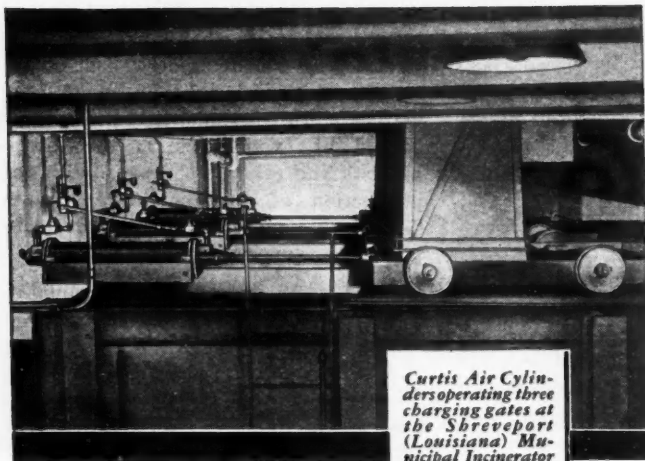
A comprehensive list of alloy steels used in cars of current production will be found in the February issue of *Nickel Steel Topics*. Tables give the name of the car, name of the part, and the SAE spec number.

—J. G.

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March 21, 1936

# Automotive

## Aircraft Engine Progress in 1935

**T**HERE is less to report regarding aircraft engine development (in Great Britain) this year than there was a year ago, but this may be because an increased degree of secrecy became desirable and not necessarily because less has been achieved. While aircraft engines of 1000 hp. have been developed in the past, none of the designs were perpetuated so far as known. If rumors are to be trusted, the Rolls-Royce Merlin engine, as fitted to the Hawker single-seater fighter, comes in this category.

For a time it seemed that the Diesel engine would be regarded with favor as a powerplant for aircraft, because it is free from one real source of danger, the formation of ice in the carburetor resulting from the joint effect of a low atmospheric temperature and the cooling caused by the evaporation of the fuel. To overcome this difficulty in the gasoline engine, attention has been directed to the possibility of direct injection of the gasoline. Good results are understood to have been achieved, but meanwhile an alternative solution of the problem, of even greater promise, has been found. It has been discovered that ice formation in the carburetor can be prevented by mixing a little alcohol with the gasoline. The continuous addition of alcohol is objectionable, because it introduces corrosion and other difficulties. So the Royal Aircraft Establishment at Farnborough has developed an automatic device which causes alcohol to be introduced into the float chamber only when freezing conditions are encountered. The automatic action is due to an ice detector in the carburetor throat. It consists of a small orifice which, when it becomes blocked by ice, causes the pressure on opposite sides of a diaphragm to become unbalanced and the alcohol valve to be opened.

Another important improvement in connection with aircraft engines is the development of automatic mixture-control systems, which are said to achieve from 14 to 30 per cent savings on fuel consumption, as compared with manual mixture control. Another line of development lies in the use of very weak mixtures in conjunction with spark advance. In some engines a saving of 14 per cent has been indicated as attained by this method.—*The Engineer*, Jan. 10.

## Needle Bearings Need Diametral Slack

**N**EEDLE roller bearings will not run satisfactorily without diametral slackness. Investigations made in several countries have shown that the needles always rotate around their own axes as they pass under the center of load. The motion of individual needles can be readily observed by grinding small flats on their corners so that if a beam of light is thrown against the ends, a twinkling effect is produced which is quite distinct from the appearance of the ends if the rollers merely slide around.

Running tests indicate that the needle roller bearing is not as efficient as a bearing having square section rollers when running continuously at considerable speed, but the former can often be applied in cases where consideration of space make the latter type inconvenient or impracticable.

Where the movement is occasional or oscillating and where there are frequent fluctuations in the direction of the load and in the speed and direction of rotation, the needle bearing has a distinct advantage, however. There are two main reasons for this, as follows:

1. The increased area of support given by the larger

*Automotive Industries*

# Abstracts

number of needle rollers of greater length than the square-section rollers.

2. Although needle rollers and races are manufactured to very high accuracy, it is impossible under commercial conditions to obtain the mathematical degree of accuracy which is essential for the complete elimination of all tendency for needle rollers to skew. Skew occurs only during the period the needle rollers are compelled to rotate on their own axes, and under the conditions just mentioned, the diametral slackness makes it possible for them to reassume correct alinement during the unloaded and sliding portion of their orbit.

In applying needle roller bearings the practice which has been found necessary with parallel roller bearings with larger rollers can be followed with few exceptions. Revolving races should be an interference fit on their seats, and care should be taken that the resulting expansion or contraction of the race will not seriously diminish the initial diametral slackness of the bearing, so that a somewhat smaller interference than with the older type of bearing is advisable. Where double interference between the races and their seats is necessary it is well to increase the initial diametral slackness.

Accuracy of alinement is of special importance in the case of the needle bearing, to prevent uneven distribution of load on the needle rollers, and on account of the effect of lack of parallelism. Where separate races are used for the needle rollers, these races are generally of light section and will conform readily to any errors in their seats, producing similar running conditions as corresponding errors in the races.

Owing to its relatively small diameter and its suitability for sustaining load where there is little movement or rapid oscillation, the needle bearing is particularly adapted to use in front-axle pivots, steering-gear and cross shafts, brake cross shafts, brake camshafts, spring shackles, balancer beam for six-wheelers, connecting-rod heads, piston-pin bearings, valve rockers, fuel pumps, transmission idler gears, and universal joints.—Paper by C. H. Smith printed in the *IAE Journal* for January.

## Germany Using Aluminum To Meet Exchange Needs

**I**N Germany there is a strong tendency at the present time to use aluminum in place of other non-ferrous metals wherever possible, in order to reduce the foreign exchange requirements. It takes 400 reichsmarks of foreign exchange per metric ton of copper imported, 198 per ton of zinc, and 2775 per ton of tin, while it takes only 23 marks per ton of bauxite, and four tons of bauxite yield one ton of aluminum. Taking account of the relative specific gravities of the metals, each ton of copper saved means a saving of 350 marks in foreign exchange.

The use of aluminum by German industry in recent years increased so rapidly that the producing industry was unable to keep up with it, and in 1934 no less than 8400 tons, or 16 per cent of the total consumption, had to be imported. An international cartell agreement limited German production to 40,000 tons annually, but in September, 1934, the quota was raised to 55,000 tons, and the 1935 production is thought to have been 52,000 tons. It is also estimated that at the end of last year the capacity of German aluminum plants was 71,000 tons annually. World production in 1934 was 170,000 tons.—*Bull. Hamburg World Economic Archives*, Jan. 1.

*Automotive Industries*



## A SAFEGUARD

Engine manufacturers who are using copper-lead and cadmium-silver bearings are faced with the necessity of exercising care when choosing assembly lubricants. When considering adjunct oils, those containing "dag"\* Brand colloidal graphite must not be confused with lubricants which enter into chemical combination with the metal. While the successful use of many high pressure anti-friction bodies depends on such chemically active constituents as chlorine, fatty acids, sulphur, etc., other lubricants exert their influence through physical rather than chemical means. Acheson's colloidal graphite, falls in this class. ✦ Proper use of this material forms on friction parts a self-lubricating, mirror-like film of graphite which assures extra protection against metal-to-metal contact in cases of temporary oil film rupture. ✦ We will be glad to forward Bulletins 112D and 40B gratis on request discussing colloidal graphite and its advantages when used as an addition product.

\*Reg. U. S. Pat. Off.



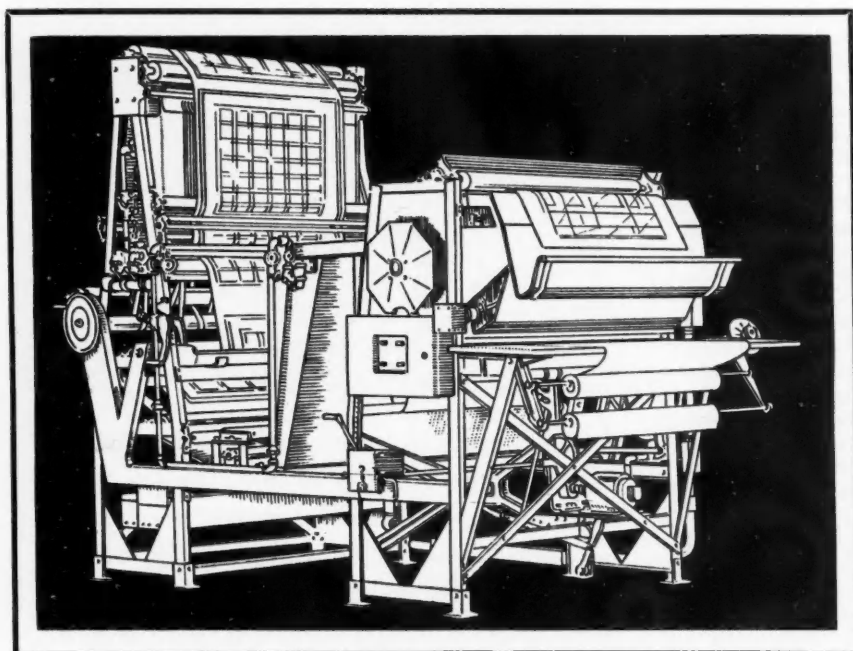
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March 21, 1936

# The FORUM—

(Continued from page 446)

Adverting to Mr. Geschelin's "Accent on Safety," I think exception could be taken to some of the kudos given the manufacturers. "All-steel bodies and safety glass all-around," hardly can be said to be universally used when the 1936 product of the largest maker employs a composite wood body, and the safety glass is optional, and at an extra charge on the major part of that maker's product. I quote from the Customers Research Staff Guide, "—it is appropriate to mention steel and wood body construction because, aside from the considerations of greater strength, the use of wood in addition to steel, accomplishes the same sort of vibration-dampening effect as



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## PEASE MODEL "11" MACHINE

the use of rubber in engine mountings, etc." How "Modern Science" shows up Stradivarius and Steinway in their improper use of wood for resonance in violins and pianos!

Headlighting has been vastly improved, Mr. Geschelin says. Admitting that fixed focusing, improved reflectors, better mounting and housing of headlights by the accessory manufacturers, all contribute toward safety, yet any one driving at night on unlighted roads is forced to recognize that the glare problem is worse than it ever was. So many new cars have been noted as glaring offenders that I have taken time to check them, and I believe the indictment should rest on certain makers, who, in concentrating on soft springing, have effected a decided uptilt when the rear seats are loaded.

The contribution to safety by the lower center of gravity of some cars must be rated negative, in fact, the largest maker plays up the high center of gravity of his lowest priced lines, and points with pride to the flat floor front and rear. The floor lines of certain 1936 models measure 23 in. from the ground, about where they were in 1925. In the higher priced lines the floor has been lowered by 4 in., with a resulting tunnel to clear the drive shaft.

When we consider road vision and its contribution toward safety, most of the manufacturers have erred in sacrificing driver's view to the style designers' wiles. High hoods that necessitate a periscope to see the road immediately in front, barred windshields and driver's windows that interfere with the driver's view of traffic, and also preclude the required hand signals, the absence of which is responsible for many accidents in which innocent victims are involved, these items are chargeable to the manufacturer who sacrifices safety to style sales-appeal.

Investigation of the braking systems of some of the recent swings to hydraulics shows pressure lines 1/32 in. thick, and flexible rubber hose lines with a factor of safety of only three. Despite dependence on the integrity of all the pressure lines for the operation of any of the four brakes, no particular attention seems to be given the shielding of these highly vulnerable pipe lines.

To sum up the 1936 models, credit should be given the accessory makers for most of the advances over older models. For some of the makers, the best that can be said is that their sheet metal designers have done an excellent job in shielding the chassis and making it appear of modern design, when in fact it is 10 years or more behind in safety and comfort features. Perhaps



if the spot light is directed in proper channels, more attention will be given by manufacturers to inherent safety

design, rather than to meretricious advertising of safety when there is no safety.  
FRANK J. CLARKE.

their own nitrate. There is no doubt that other countries without petroleum resources will follow suit in the making of synthetic gasoline by one of the more important processes (Bergius, Fischer, etc.).

Wood is plentiful in Germany, and it is being used more and more in wood-burning trucks and buses, either directly or as charcoal. There will be a place for gasoline-driven motor cars, for Diesel-powered trucks and buses, and also for wood burners.

The difference between 6.16 marks  
(Turn to page 453, please)

## Synthetic Gasoline in Germany

Editor, AUTOMOTIVE INDUSTRIES:

In *Automotive Industries* recently, there appeared an article dealing with the subject of wood as motor fuel. This article needs some correction, in order that the real reasons for the use of wood in German buses and trucks may be understood.

First of all the motor fuel situation in Germany is quite different from that in the U. S. A.

There is hardly any crude oil in Germany, and therefore much less natural motor fuel. Such fuel must be either imported, which involves the loss of valuable currency, or else nature's work must be imitated and synthetic gasoline made. Germany has gone in for producing synthetic gasoline in a big way, and this offers many advantages to the country. There is sufficient coal available, and this is being used as raw material for the motor fuel. It is fed with hydrogen into strongly-built vessels, heat and pressure are applied, and at the end of a long process—nature imitated by man—gasoline spouts from these vessels.

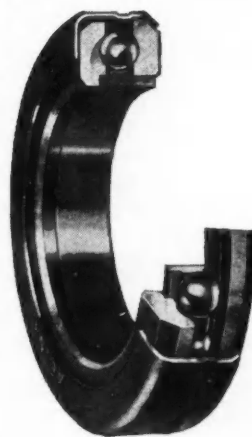
There is no doubt that all of this costs money. First of all the processes must be developed, experiments made, and chemists, engineers and workmen paid. Experimental units must be built, which in turn have to be replaced by larger units to make the manufacture of synthetic gasoline on a commercial scale feasible. Plants, equipment and installation have to be capitalized, and operations and the purchase of raw material must be financed. It can be readily seen that a large amount of money must be spent before even a drop of oil or gasoline is shipped.

As for the taxation of imported gasoline, that is necessary in order to enable a synthetic plant to keep going. If all of the gasoline now being used in Germany had to be purchased abroad, the currency of the country would soon be endangered. The production of synthetic gasoline has a social as well as a national justification, as it gives thousands of workers a weekly pay check and sets money free for the purchase of other raw material.

Synthetic gasoline had a fore-runner in synthetic nitrate. In pre-war times this product was obtained exclusively from Chile, which country had a monopoly on the supply. The whole world

purchased nitrate there, and Chile set the price. The development of processes for the fixation of atmospheric nitrogen did away with this monopoly. Today all important countries make

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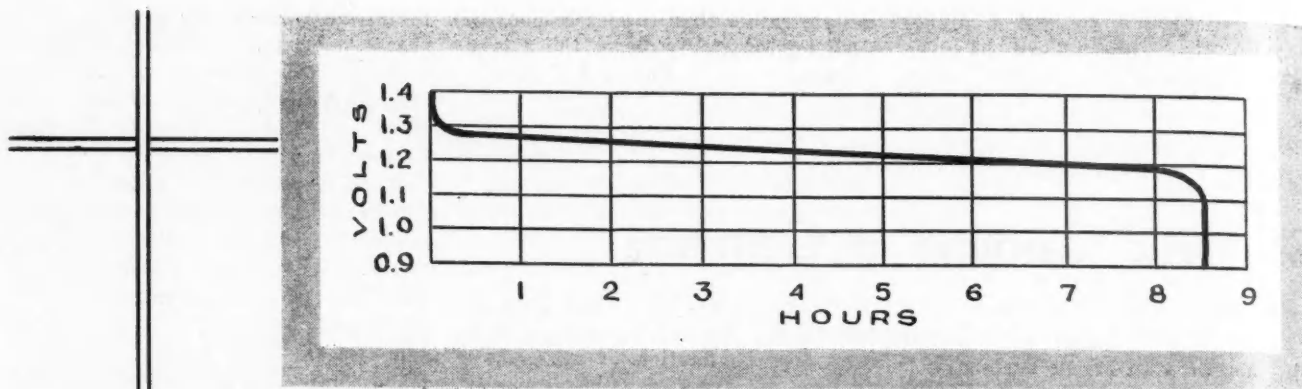


Fig. 2—Discharge curve of Nobel cell

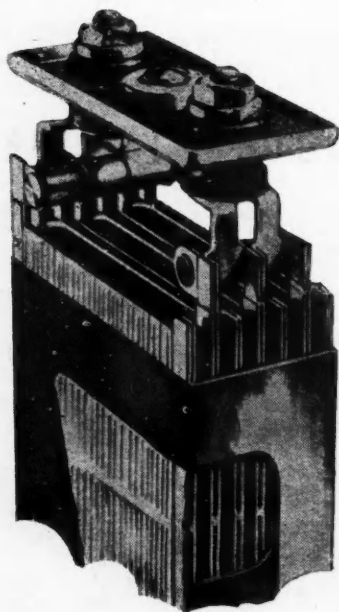


Fig. 1—Cutaway view of Nobel alkaline storage cell

## Nobel Battery Has Low Internal Resistance

THE Nobel storage battery, to which reference was made in "Production Lines" some time back, is manufactured by Accumulator A.B. Leif Nobel of Stockholm, Sweden. It is an alkaline battery and is claimed to be exceptionally compact, light and strong. As may be seen from the accompanying discharge curve, the initial discharge voltage is 1.32, while the final voltage after an 8-hour discharge is 1.18, and the average voltage during the discharge period is 1.23. The new battery is said to have a low internal resistance and to be adapted for use as an automobile starting battery. It is further claimed for the battery that it will not lose charge when left to itself for months at a time, and that it can be left standing discharged without deterioration as long as the temperature does not exceed 110 deg. F. or drop below zero. As its structural parts are made entirely of steel, the battery will withstand considerable vibration.

Results of a test of the battery made by the Electric-Heat Institute of Stockholm have been furnished us. The test was a comparative one, covering one 22-amp.-hr. Nobel battery and one 22-amp.-hr. battery of another Swedish

make said to be well known. Both batteries were of the alkaline type. After being discharged to 0.8 volts per cell, each battery was charged at the rate of 4.71 amperes for 7 hours and then discharged at 2.75 amperes until the voltage dropped to 1.10.

After one hour's discharge at the rate mentioned the voltage of the Nobel battery had dropped to 1.262, and after seven hours' discharge, to 1.201. The capacity of the Nobel battery was found to be 23.9 amp.-hrs. and its specific capacity 11.1 amp.-hrs. per liter, which corresponds to 3.14 amp.-hrs. per cu. ft. The volume per amp.-hr. capacity of the Nobel battery was 5.5 cu. in., and the specific weight of the battery is given as 0.242 lb. per amp.-hr., but it appears that this specific weight applies to a larger battery and not the one on which the tests were made. In comparing the figures given with corresponding ones for lead batteries, the lower voltage of the alkaline battery must be taken into account, of course.

According to the catalogue of the firm, a five-cell battery having a voltage of 6 and an ampere-hour capacity of 40, is 11 1/8 in. long, 4 5/16 in. wide and 10 in. high over all. The weight of this battery is not given, but that of a similar battery of 30 amp.-hr. capacity is 16 1/2 lb.

Nobel batteries for trucks, locomotives and train lighting are said to weigh 66 to 88 lb. per kw.-hr. and to have a volume of between 0.85 and 1.13 cu. ft. per kw.-hr.

## The Forum

(Continued from page 451)

for wood (or 9.26 marks for charcoal) in wood burners and 21.08 marks for gasoline-engines per 100 km., including capital charges, is an incentive which cannot be disregarded.

The high initial cost and rather large sizes of the generator equipment are being reduced more and more. The sizes built today differ very much from those of some years ago, and the efficiency has been greatly increased.

The loss of power can be overcome by the use of well-designed combustion chambers with pistons such as the EC, which are cast in high-conductivity light metal for the top section, with the skirt and ring section having a wear-resisting aluminum alloy. With such pistons the compression can be made so high that there is practically no loss of power.

Price and consumption of gasoline must be based on cost plus tax, as there is hardly a country which does not put a tax on it.

The assumption that economy of wood burners is fictitious has therefore no factual basis.

More wood burners are being seen on the roads today than in former years, which goes to show that there is economy in burning wood.

P. STICKEL,  
Elektronmetall G.m.b.H.  
Bad Cannstatt, Germany.

## The Horizons of Business

(Continued from page 444)

one knows how much. Some well-informed people believe it sufficient to affect the course of the market. In fact, it was solemnly stated by one broker in an offside hush that American speculators operating in a London fog which the SEC could not pierce were "selling the pants off the American market" in anticipation of war. For the time being this scandalous purpose has apparently been frustrated.

This hypothesis is interesting rather than formidable. Although manipulative pools may achieve some success in single issues and perhaps even in minor jiggles of the market, they cannot defy the trend except at great cost. The real speculator is not one who bets on the market first and then drugs the other horse. He is successful only if he can anticipate the course of public favor. This in turn depends upon factors which no individual or group of individuals can control. The theory of omnipotent manipulation makes a plausible alibi but never an authentic analysis.

*Automotive Industries*

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who do not know  
..... Simple to  
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L A T R O B E, P A.

March 21, 1936



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CARBORUNDUM engineering and research facilities have combined in producing this outstanding machine, destined to advance materially the art of precision and finish of honed cylinders.

By combining a proper, uniform, rotary motion with a mechanically-controlled, hydraulically-powered reciprocation movement, straight, round and true cylinder bores honed to extremely close tolerances and to any degree of finish are assured with this new machine. There is a positive control of stroke length—no over or under running of the work. There is positive control over conditions due to load changes—there is control over changes due to temperature variations.

A wide range of speeds is at the command of the operator: rotation speeds by the simple turn of the crank on the variable speed drive—reciprocation speeds by adjustment of hydraulic fluid metering valve. No bothersome "pick-off" gears.

The Hutto patented grinder (hone) is equipped with full-floating opposed-cones and Carborundum Brand Abrasives. A drivehead with a micrometer set and stop holds tolerances to as close as .0002" without danger of running oversize.

The new machine is available in any size—single or multiple spindle design—vertical or horizontal—equipped with "Hutto" grinders (hones)—fitted with Carborundum Brand Abrasives.

Work range from ½ to 12-inch diameter bores on the standard vertical machines (special machines to suit requirements)—horizontal machines for bores of any diameter and length.

Send for descriptive literature.

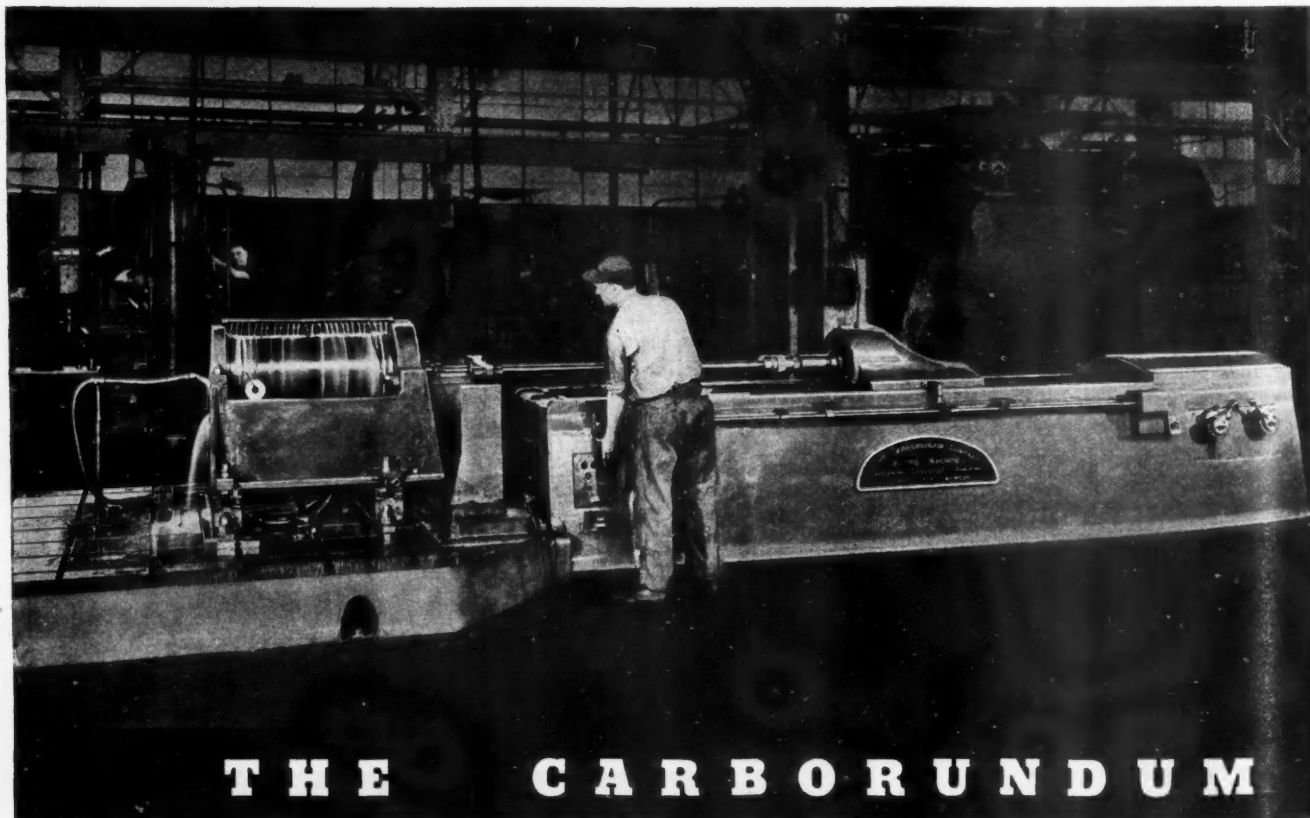
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